

# COMMERCIAL FISHERIES *Review*

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DIV. OF FISHER



COVER: Fishing port of Hvide Sande, west coast of  
Jutland, Denmark. (Inga Aistrup Foto)

# COMMERCIAL FISHERIES

## Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.



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Gloucester, Mass.

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BCF IS SHAPING MASTER PLAN  
TO AID U. S. FISHING INDUSTRY

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Sorting the species.

## BCF IS SHAPING MASTER PLAN TO AID U. S. FISHING INDUSTRY

The Bureau of Commercial Fisheries is devising a plan that will evaluate the status of 28 fisheries and systematically determine the projects necessary to solve their most urgent problems.

At the beginning, this master plan would be useful primarily for Federal programs. Later, after industry, academic institutions, State governments, and public or private agencies concerned with the fishing industry have analyzed and contributed to it, the plan would be elevated to the rank of a national plan.

The plan was introduced to fishery groups meeting in Miami Beach, Fla., on June 10 by BCF Director H. E. Crowther. He said several segments of the fishing industry face financial difficulties, while for others, if appropriate action is taken, "prosperity could be just over the horizon." The problem facing all persons concerned with the industry is how to set a course "so that the industry as a whole can prosper."

Director Crowther stated: "Never in the history of the U. S. fishing industry have so many been so concerned about the direction in which our fisheries are heading." The following developments have contributed to this state of affairs:

- Hundreds of large, modern, foreign trawlers have appeared off U. S. coasts and changed the fishing future for U. S. fishermen. If the latter do not fish these resources, foreign fishermen will.

- At least one-half of humanity suffers from malnutrition. World leaders have begun to realize the ocean's potential in feeding the hungry.
- There is need for oceanographic research to tap the ocean's wealth, study the ocean floor, and for military operations.
- Foreign seizure of U. S. vessels has thrust fishing onto the world diplomatic stage.
- The U. S. has not increased its catch in the past 10 years, while other nations have made remarkable gains.

Against this background, BCF began to take a harder look at its own past efforts, programs, and goals to see if it was using its money most effectively. The Bureau came to several conclusions:

- It is a mistake to assume that a few, or even all, actions would solve all or most industry problems. There is no single fishing industry. There are harvesting, processing, and distributing segments. There are many fisheries. And many of these can be broken down into smaller segments on the basis of geography, gear or vessels used, and types of markets and products for which the fish primarily are caught. Each segment "must be treated separately in order to identify the problems and decide what is needed to provide solutions."

● The efforts of those working on fishery problems are spread over about 250 species. In the past, "it has been possible to attack only a few of the most critical ones."

● Never have the U. S. fisheries received so much attention. Many individuals and groups are concerned about the fisheries, yet our course is not clear. The belief that problems should be identified on a fishery-by-fishery basis impelled BCF to start developing a "Master Plan for Commercial Fisheries."

### THE BCF PLAN

In its final form, the plan will divide U. S. fisheries geographically: New England, Mid-Atlantic, South Atlantic, Gulf, etc. Each section will contain information on major fisheries in one area. In New England, for example, such species as haddock, cod, yellow-tail, lobster, and herring will be included. For each of these fisheries, there will be a priority list of work needed. Each item of work will contain an estimate of cost, and designate the body responsible for carrying it out: industry, a university, a State, or the U. S. For the BCF plan to become a national plan, there would have to be agreement among all groups regarding "priority, cost, and responsibility."

### Fashioning the Plan

● BCF selected 28 fisheries with which to work initially. These account for over 90 percent of the U. S. catch both by volume and value. Additional fisheries will be included as experience is gained with the plan.

● The second task was to find a method of selecting projects or actions necessary to solve the most pressing problems of a fishery. Because BCF's experience showed that it is almost impossible for any person to consider all of a fishery's possible needs when determining priorities, the Bureau developed a checklist. This checklist is divided into 5 major categories: resource supply; access to and efficient harvesting of resource; handling and processing (aboard vessels and ashore); distribution and marketing; fundamental knowledge. And these 5 categories are divided into many components.

BCF "attempted to include in the checklist all actions or projects that may be needed in any U. S. fishery. It is simply a means of insuring that all possible courses of action are considered when a program of work is being developed."

Before the checklist can be used meaningfully, there must be agreement on the objectives of work to be included in the Master Plan. Suggested national objectives are being developed.

● To produce a working document involving each major fishery, BCF selected from the checklist those actions or projects necessary to accomplish the national objectives. These projects--in order of priority--would give the proposed program for that fishery or species. Shown on next page are sample priority lists developed for thread herring and king crab.

## THREAD HERRING

### Priority Areas of Work

#### Resource Supply

##### Resource assessment

- Distribution in time and space
- Magnitude and potential yield
- Commercial feasibility

#### Access to and Efficient Harvesting of Resource

##### Improved harvesting efficiency

- Gear development and improvement
- Fish behavior
- Economics of harvesting
- Prediction, including intelligence system
- Extension

## KING CRAB

### Priority Areas of Work

#### Resource Supply

##### Maintaining the yield

- Life history
- Population dynamics
- Subpopulations
- Environmental relationships
- Prediction
- Economic, political, social and legal aspects, domestic and international

##### Statistics

##### Resource assessment

- Distribution in time and space
- Magnitude and potential yield
- Commercial feasibility

## KING CRAB (Contd.)

### Priority Areas of Work (Contd.)

#### Assess to and Efficient Harvesting of Resource

##### Resource allocation

- Domestic versus international fisheries
- Limited entry

#### Distribution and Marketing Quality maintenance

- After the list is completed, program planning experts must assign costs and time periods to the priority actions. Because items on the priority list identify only major work areas, specialists will have to develop detailed project plans.
- Limited financial, physical, and human resources make it impossible to implement all items for all fisheries. "So the final question becomes: Which fisheries are most urgently in need of assistance or can be helped most effectively with limited program dollars?"

The answer seems simple: Invest in fisheries with the greatest potential--or where the payoff per dollar spent is greatest. Actually, the answer is not quite that simple. More detailed information must be obtained before some decisions can be made. BCF is moving to improve its information base. The Bureau "is convinced a Master Plan will provide a systematic approach to select among alternatives."



● BCF will consult with all interested public and private groups to complete the Federal plan and then develop it into the form of a national Master Plan for Commercial Fisheries.

Such a comprehensive national plan would have many advantages. It would

1. Consolidate thinking in the commercial fisheries and provide agreement on charting the course for the future.

2. Avoid duplication of effort.

3. Guide BCF and the States in matching-fund programs.

4. Permit orderly development of legislation needed for the fisheries.

5. Give U. S. and State appropriation agencies the information about the fisheries that is needed to make decisions.



Dressing fish. (J. J. Murray)

# UNITED STATES

## U. S. Trades Fish With USSR

The U. S. has obtained from the Soviet Union the only species of pike foreign to North America--the Amur pike. In return, the Soviet Union received shipments of 20,000 newly hatched striped bass and 50,000 steelhead trout eggs. All shipments arrived in Moscow in satisfactory condition. This was the fourth and largest exchange of fish and fish eggs between the two countries. The purposes of the trades are to further science and to help the USSR increase its food supply.

### Amur Pike Research

The Amur pike--over 1,000 healthy fry--have been given to Pennsylvania for genetics research and related projects.

If enough pike survive, some will be placed in reservoirs. There is the possibility of a new American sport fish--if the Amurs thrive in Pennsylvania waters. They occasionally grow to 40 inches and 35 pounds. Their natural habitat is the Amur River separating China from the Soviet Union.

### Began In 1964

Limited exchanges of fish and fish eggs followed discussions begun in 1964 by Interior's Fish and Wildlife Service and the Soviet Union's All-Union Research Institute of Marine Fisheries and Oceanography.

A series of striped bass, steelhead trout, and smallmouth bass shipments was made to the USSR in exchange for sockeye salmon. Transportation problems often caused mass mortalities. No exchange was attempted in 1967.

Sockeye salmon, received in 1965, are the subject of research at the BCF laboratory in Bowman's Bay, Wash.



## Report Analyzes Ocean's Economic Effects on Southern New England

In 1965, 11.1 percent of total personal income in the Southern New England Marine Region was produced by economic activity directly dependent on the closeness of the ocean. This is revealed in a recently published study by economists of the University of Rhode Island (URI).

The Southern New England Marine Region includes Rhode Island, New London County, Conn., and Barnstable, Bristol, Dukes, Nantucket and Plymouth counties, Mass.

The study focused on the impact of ocean and continental shelf resources on the economy of a coastal region. It was designed to help planners develop those resources. The economists say their study of the southern New England region can be applied to other regions--if marine activities there operate in a similar framework.

The study was part of a cooperative program with the U. S. Department of Commerce's ESSA and Economic Development Administration. It is one of several projects Commerce agencies are supporting to encourage economic development of the continental shelf and coastal regions.

### The Study Findings

The 11.1 percent figure did not include money spent by tourists in such nonmarine places as motels, restaurants, and gas stations.

A URI team surveyed 400 individual ocean-oriented businesses during the summers of 1965 and 1966 to gather the data.

The report divides the marine industries into 13 categories: fish catching; fresh fish processing; frozen fish processing, fish wholesaling and jobbing; ship and boat building; marinas and boat yards; marine retail and wholesale; marine manufacturing; construction, towing, agents; research and education; marine military; charter fishing; and other marine activities.



In the Southern New England Marine Region, the gross sales of ocean-oriented businesses were \$773,049,000 in 1965. The ship and boat building category had the highest sales: \$318,290,000. The marine military category had the greatest effect on personal income because the Navy spent much on wages and salaries.

#### Stimulates Economy

Activities based on catching, processing, and using fish can stimulate the region's economy: "A modest rate of growth in landings value of 1 percent per year over 5 years (\$284,840 the first year) would yield an average annual increase of \$769,583 in gross output of the region. . . . The resulting average annual rate of increase in personal income is .66 percent in the region and gross non-marine output would increase at an average annual rate of .26 percent."

To make it easier to use the data in other regions, the report describes the physical and economic setting of the Southern New England Marine Region. It covers land environment, coastal and offshore environment, the region's economy, population, labor market, and patterns of trade. There are maps of topography, river basins, tidal currents, average annual precipitation, mean temperatures for January and July, transportation network, population density, and land use.

The 132-page report is titled, "Economic Impact of Marine-Oriented Activities--A Study of the Southern New England Marine Region." It was prepared by Niels Rorholm (chairman), Harlan C. Lampe, and Joseph F. Farrell of URI's department of food and resource economics, and Nelson Marshall of the Graduate School of Oceanography.



### Save-the-Estuaries Campaign Is Announced

A national campaign to alert the public to the critical condition of the Atlantic Coast estuaries has been announced by the American Littoral Society of Sandy Hook, N. J. The Society's campaign will cover the coast from Maine to the Gulf of Mexico. It will include

an inventory of estuarine resources, surveillance of operations that threaten those resources, and a program of conservation education.

John Clark, Society President, said: "In the recent development of interest in the ocean depths, we seem to have lost sight of the importance of the estuaries. The wealth of our estuarine frontier, including the coastal marshes, tidelands, bays, sounds, and tidal rivers is being rapidly dissipated because of the lack of understanding of their unique values."

The program is funded by grants from the Old Dominion Foundation and the American Conservation Association.

#### The Society's Program

The Society will concentrate on these estuarine problems: "the effects of pollution upstream, at the bay mouths, and offshore; the conflict between developing estuarine areas for housing and industry and preserving them for fishing, recreation, nature study, and scenic enjoyment, the conflict between the navigational and the ecological needs of estuaries; and the complexities of local, state, and Federal laws which govern the use of coastal lands."

Clark added: "Our area of interest is under heavy population pressures. Almost half the Nation's population lives within a day's drive of the coast. Over 50 percent of the estuarine area has already been lost in certain areas and this is the area where about 65 percent of our fish population either breeds or spends its juvenile period of growth.

"There has to be a balance between the legitimate human needs for space on the coastline and the wildlife needs for the same area. If this balance is not struck soon, the values which attract man to the ocean will be lost forever. An acre of marsh covered with refuse or filled in for housing is a lost resource and these resources are being lost too fast.

"Our program will take into account the needs of the commercial fisherman, the sports fisherman, the boat owner, the people who simply wander the beaches and marshes, as well as the needs of communities and industries located near the shore."

The American Littoral Society is a national, nonprofit organization started in 1961 by fishermen, skin divers, and nature lovers interested in preserving the estuarine area. It has thousands of members.



## Mechanical Feeder Aids Fish Farmer

A mechanical fish feeder has been invented by the director of training programs for the Arkansas Office of Economic Opportunity, Dr. Earl E. Evans. He says it will reduce the farmer's work and insure equal distribution of feed. Dr. Evans operates a 45-acre farm of blue and channel catfish near Pine Bluff, Ark. He added that one man using the mechanical feeder could distribute as much feed in an hour as 10 men working by hand in the same time.

Dr. Evans noted that the feeder was made up of a hopper that holds 600 pounds of pellet or bran feed, a blower fan, and a feeder pipe. The machine can be mounted on almost any farm tractor. It is run by the tractor's power takeoff.

### How It Works

Dr. Evans pointed out that the machine could blow the feed as far as 15 feet from the banks of the pond. This would make for more even distribution of feed. When feed is spread by hand, he said, most of it will be at the pond edges. The fish in the middle would not get as much. With his portable mechanical feeder, the farmer can circle the pond and get equal distribution.

He began work on the feeder in 1966 and perfected it early this year. He was granted patent pending rights in January. Dr. Evans said the machine is not in full production yet, but some are produced on special order. ("Feedstuffs," June 8, 1968.)



## Interior Apportions Funds to States for Fish and Wildlife

On July 1, \$22.1 million in Federal Aid funds for fish and wildlife restoration became available to the 50 States--an increase of \$1.5 million over last year's record.

Of the \$22.1 million, \$17.4 million is for wildlife restoration, and \$4.7 million is for sport-fishery projects. Another apportionment for fish and wildlife restoration projects will be made in the fall.

### Excise Taxes Provide Funds

The fish and wildlife funds come from Federal excise taxes collected from manufacturers, importers, and producers of certain types of hunting and fishing equipment.

Under the Federal Aid programs, States are reimbursed up to 75 percent of the cost of approved projects. The laws creating these programs also provide \$10,000 each to the Commonwealth of Puerto Rico, Guam, and the Virgin Islands. The 1969 fiscal year apportionments to these areas are included in the total apportionment.

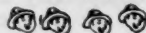
Distribution of funds is based on the number of paid hunting and fishing license holders in a State and the area of that State. The programs are administered by Interior's Bureau of Sport Fisheries and Wildlife.



## "People to People" Tour of South America

Dr. Mark Keyes, a staff veterinarian of the BCF Marine Mammal Biological Laboratory, Seattle, Wash., completed a 28-day "People to People" tour of 7 South American countries. He was part of a 12-person delegation of veterinarians and wildlife scientists.

Their objective was to contact their counterparts personally in order to establish the lasting lines of communication that could promote goodwill and understanding between the U. S. and South American countries. The tour was initiated by the Citizens Ambassador Travel Program, an organization formed under President Eisenhower's leadership when he was in office.



## OCEANOGRAPHY

### U. S. Invites World to Join in Decade of Ocean Exploration

The United States is urging all nations to join in a 10-year effort to explore the world's oceans. The invitation is contained in a report released on May 29 by the National Council on Marine Resources and Engineering Development. The Council, better known as Marine Sciences Council, is a Cabinet-level advisory group headed by Vice President Humphrey.

The report elaborates on President Johnson's proposal of March 8, 1968, for an International Decade of Ocean Exploration in the 1970s. It seeks to encourage development of the "Decade" concept by scientists, engineers, and representatives of industry and governments. It gives examples of the kinds of projects that nations might undertake--and discusses aspects of the projects that must be worked out together.

The report notes that a joint non-Government/Government planning staff will be created under the Council to plan the U. S. contribution to the Decade. It invites the scientific and technical communities to take part in this planning, especially through the National Academies of Science and Engineering.

#### The President's Proposal

Following his proposal, the President stated that the activities of the Decade could:

- "expand cooperative efforts by scientists from many nations to probe the mysteries of the sea;
- increase our knowledge of food resources, to assist in meeting worldwide threats of malnutrition and disease;
- bring closer the day when the people of the world can exploit new sources of minerals and fossil fuels."

#### The Concept

Science has shown that the ocean is an important source of food and minerals for a booming world population. The capability now exists to explore the seas. Because of the vastness and complexity of the marine environment, a broad program of exploration can be carried out only through international cooperation. The Decade can further the

economic and scientific development of all participants. It can develop resources, especially new sources of food, badly needed in the world's developing areas. "Thus, emphasis should be placed on the identification and assessment of food and mineral resources as well as investigation of ocean processes."

#### Geographical Exploration

To realize the sea's full food potential, scientists will have to assess unused fish stocks "readily available to current fishing techniques." Also, there are known resources in the deep ocean and in mid-depths that cannot be harvested economically at the present time.

The report states: "Expanded efforts to locate fish more precisely, increase the efficiency of capture, and predict abundance and availability of the stocks on a seasonal basis should lead to substantial improvements in fish catch. Increased efficiency also will expand the need for scientific management techniques to avoid overfishing and disturbing the ecological balance. Improved understanding of fishery resources and their reactions to natural and manmade disturbances is necessary to increase and maintain the yield and to resolve international fishery conflicts."

There is need to learn much more about the "composition and distribution of nonliving seabed resources." The growing demand for energy and minerals has spurred the search for these resources on the Continental Shelf.

#### Development of National Programs

Almost every operation a nation conducts to investigate or operate in the marine environment aids its general capability to explore the oceans and to understand them better. And, the report emphasizes: "During the Decade all nations would be encouraged to identify how ocean exploration can contribute to scientific and economic development, and accordingly

- develop their capabilities for exploring the oceans;
- expand national ocean exploration programs; and
- share with other nations experience and scientific data acquired from these national programs."

Most nations are interested primarily in ocean exploration programs close to home shores--"exploration of the Continental Shelf and of coastal fishery stocks." Some nations are moving their investigations farther out to sea. But most ocean exploration in the foreseeable future will probably continue to be coastal activity. However, if nations conducting this kind of activity would share their experiences and data, other nations would benefit. "Advances in marine science and technology depend critically upon the effective flow of information--from data collectors to data consumers."

The existing national and international systems for exchanging the ever-increasing marine data have to be strengthened. Attention should be paid to the "compatibility of national data systems."

National programs to improve navigational accuracies can contribute much to the Decade's success.

"Skilled manpower is essential for any nation to enhance its capabilities for exploring the oceans."

#### Suggested International Projects

The report of the Marine Sciences Council suggests the following types of projects "as a point of departure for international discussions":

- "surveys of selected ocean areas, principally from oceanographic ships, complemented by increasing use of other platforms such as spacecraft, buoys, submersibles, and ships of opportunity;
- intensive study of designated ocean areas of limited expanse;
- research directed to specific ocean phenomena;
- development of improved world-wide data collection, processing, storage, and distribution facilities and services to facilitate international exchange of data; and
- assistance in strengthening the capabilities of the developing nations to participate in exploration programs, including manpower training.

The report puts forward these types of objectives for international collaborative projects:

#### "1. Exploration of Living Resources

Assessment of living resources useful to man in uncharted regions of the world ocean.

Assessment of current utilization of known fishery stocks.

Acquisition of knowledge relating living resources to their environment in order that greater efficiency in their capture and conservation can be achieved.

#### 2. Exploration of the Ocean Floor

Determination of the geological structure and mineral and energy resource potential of the world's continental margins.

Preparation of topographic, geological, and geophysical maps of selected areas of the deep ocean floor.

Coring and drilling on the continental margins and deep ocean floor in selected areas.

#### 3. Exploration of Ocean Processes

Study of scales of motion in the sea and the dynamics of ocean current systems.

Investigations of surface boundary processes, such as the growth and propagation of ocean waves.

Investigations of evolutionary processes of ocean basins.

#### 4. Assistance to the Developing Nations

Mapping of selected areas of the Continental Shelf of developing nations.

Surveys of the coastal fishery resources of the developing nations."



## Past International Cooperation

The report notes the record of international cooperation by scientists throughout the world to show that a good basis exists for cooperation in the 1970s. It mentions the International Geophysical Year in the late 1950s, the International Indian Ocean Expedition, the International Cooperative Investigation of the Tropical Atlantic, the Cooperative Study of the Kuroshio, and the work of international organizations and of scientific bodies.

The report urges that international planning for the Decade be "pursued as quickly as practicable." The U. S. has begun discussions with other nations on the concept of the Decade. "The U. S. has not attempted to prejudge the scope, the international collaborative projects which would develop, nor the international arrangements for planning and coordination."

And the Marine Sciences Council points to a primary target: "The continental margins will undoubtedly provide the greatest economic return during the Decade. However, the deep oceans cover by far the largest and least known areas. It is in the deep oceans that international cooperation will provide a common scientific return leading to future economic reward. Because of the high cost of operations at sea, it is of great importance that plans be coordinated internationally to insure that areas with the highest potential interest to the most users be given priority attention."



### WHAT IS THE PRESSURE AT THE DEEPEST PART OF THE OCEAN?

The pressure at the deepest part of the ocean is close to 7 tons per square inch, almost a thousand times the atmospheric pressure on the earth's surface.

At a depth of 3,000 feet, a pressure of 8,100 pounds per square inch is sufficient to squeeze a block of wood to half its volume so that it will sink.

At a depth of 20,000 feet, air will be compressed so much that it will weigh as much as the surrounding water. ("Questions About The Oceans," U. S. Naval Oceanographic Office.)

## First Estuarine Prediction Service Launched

The first estuarine prediction service in the U. S. has been launched. The Federal Government hopes it may develop into an important service for government and private agencies in pollution control.

The service will be conducted by ESSA as a 1-year pilot program for Penobscot River and Bay Estuary in Maine. Other Maine estuaries may be added later. The possible expansion of the program to other states will be considered.

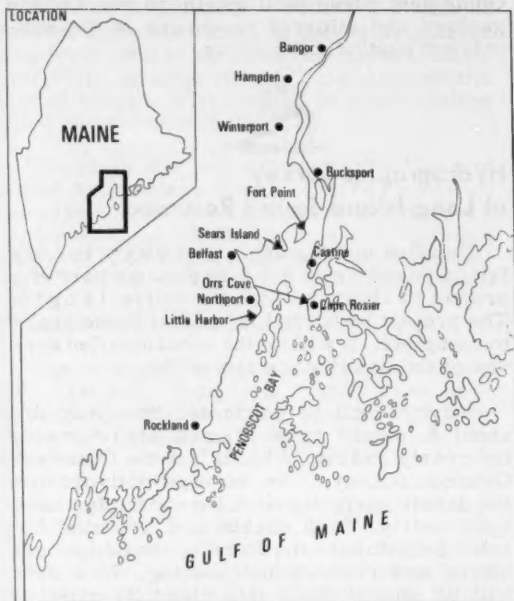
The predictions will be made by ESSA's Coast and Geodetic Survey--with the necessary river discharge forecast and advisory information provided by ESSA's Weather Bureau.

The program is designed to aid Federal, State, county, and municipal agencies and private industries concerned with water pollution. It is concerned with fisheries, public health, recreation, drinking and industrial water, sewage, industrial wastes, and both industrial and residential development.

### How Program Will Work

Advance forecasts will be issued the 3rd and 18th of each month on the rate possible pollutants will pass through the estuary. The rates will be computed through the modified tidal prism concept developed by B. H. Ketchum of the Woods Hole (Mass.) Oceanographic Institution.

The "flushing rate" is the average time fresh water or suspended matter (potential pollutants) will remain in various parts of the estuary. Such predicted rates will give the number of days fresh water or suspended matter need to travel from selected points past the outer end of the pilot area at a line extending from Cape Rosier to Little Harbor. "The selected points are at lines drawn across the estuary at Bangor, Hampden, Winterport, Bucksport, Fort Point, southern tip of Sears Island, Belfast to Castine, and Northport to Orrs Cove. The predictions can also be made for any other points along the estuary."



Penobscot River and Bay Estuary in Maine where Nation's first estuarine prediction service is being launched. The Federal Government hopes it may develop into an important pollution control service for government and private agencies.

#### Service's Practical Effects

Charles R. Muirhead, acting chief of Coast and Geodetic Survey's Oceanographic Predictions Section, described the service's practical effects:

"Let us assume that various commercial wastes are being deposited at the head of the estuary. Dependent on the rate of speed at which these wastes travel, they will either pass to the ocean without any harmful effect to the estuary or they will slow down and perhaps pollute the areas in which they linger.

"A decrease in the water's flow and circulatory patterns, such as may occur during the summer months when rainfall is normally reduced, may cause the water to become polluted.

"This service will enable State and local authorities to institute possible remedial measures to reduce the rate at which potential pollutants are being added to the water until the water flow increases."

Muirhead said the service could be "of tremendous importance to commercial and sport fisheries, wildlife conservation, and recreational activities during summer months, including swimming and boating."

The forecasts will be issued to Maine and Federal agencies.



#### Bering Sea Floor Survey Planned

The U.S. is undertaking an extensive survey this summer of the continental shelf beneath the Bering Sea. It will include a search for indications of gold, tin, platinum, or petroleum beneath the sea floor.

The survey is being conducted by scientists of ESSA and Interior Department's Geological Survey as part of a long-range national program to map the 862,000 statute square miles of the continental shelf--the last frontier of the U. S.

The survey will be concentrated off Nome, Alaska, between St. Lawrence Island and the Seward Peninsula, in western Norton Sound. It will be the most comprehensive survey of these waters ever made.

#### A Different Gold Rush

During the gold rush of 1896-99 there was gold placer mining of the sands at Nome. Now the search for gold is turning to the waters offshore, where old beaches and stream deposits exist. The Norton Sound area was uncovered during the Ice Ages. Then, the sea level was much lower than today, and gold was concentrated along streams and beaches as it is today. This was confirmed by U. S. Geological Survey reconnaissance last year. It was conducted in cooperation with the University of Washington and the U. S. Bureau of Mines. The survey also showed the presence of thick layers of sedimentary rock under much of the northern Bering Sea. This raised the possibility of petroleum deposits under Norton Sound.

#### The Operation

The survey will be conducted from 2 Seattle-based ships of ESSA's Coast and Geodetic Survey, the USC&GSS "Surveyor"

and "Oceanographer." The Surveyor was scheduled to be in the area from June until September; the Oceanographer from about mid-July until late August.

The ships will map the offshore area using precise electronic navigational control. Sediment samples of the Bering Sea bottom and profiles of the geologic formations beneath the sediment will be obtained on the ships by a team of five U. S. Geological Survey (USGS) scientists. The samples will be analyzed for mineral content at the USGS laboratories, Menlo Park, Calif.

Data gathered will be analyzed by scientists of both agencies. The survey will provide data for bathymetric maps showing the shape of the ocean floor, for nautical charts, and for magnetic anomaly and gravity anomaly maps. These Coast and Geodetic Survey maps will provide a base for plotting the sediment analyses and profiles of the geological structure. This will permit the Geological Survey geologists to evaluate mineral and oil potential under Norton Sound.

#### Geologic Information

The survey also will provide geologists with information on the area's geological history. It may prove possible to map the outline of shorelines, river valleys, and glacial deposits that once existed above sea level.

The scientists will search for submerged beach ridges and stream valleys to determine the area's drainage pattern when it was emergent. The sea valleys are particularly interesting because they drained the area of the gold placer deposits near Nome.

The Bering Sea survey is a pilot project conforming with recommendations of the National Council on Marine Resources and Engineering Development. The long-range view is to extend the program to the continental shelves off the Pacific, Gulf, and Atlantic coasts.

The Alaskan shelf is about two-thirds of the entire submerged area. ESSA currently is surveying the entire shelf. Bathymetric maps of its topography already have been issued for parts of the coast off the Aleutian Islands, Oregon, Southern California, New England, and the mid-Atlantic Coast. The

Geological Survey will use these maps of the geology and mineral resources of the submerged continental margin.



#### Hydrographic Survey of Long Island Sound Resumed

Detailed hydrographic surveys in Long Island Sound resumed in June as part of a project to chart the Sound's entire length. The project began in 1966 and will take years to complete. It will be the most detailed survey of the Sound since the 1800s.

Surveys will be conducted this year for about 4 months by a 15-man, shore-based, field party and the "Whiting" of the Coast and Geodetic Survey. The surveys will provide the latest navigational information for nautical charts. Such charts are essential for safe navigation in the Sound of seagoing commerce and recreational boating. New data will be incorporated into about 20 existing charts and be used in producing 4 new, large-scale, charts planned for Long Island's north shore.



#### Study Ancient Alaskan Sea Channel

U. S. oceanographers are studying new data on a sea channel at the bottom of the North Pacific. It is just south of the Aleutian Islands and once connected North America with a vast underwater plain.



Dotted line indicates how sea channel may have once connected the vast Aleutian Abyssal Plain, three miles below the surface of the sea, with Alaska. When the Aleutian Trench was formed some 10 to 50 million years ago, it apparently broke the connecting link. U. S. oceanographers recently investigated the channel for new evidence on the geological history of the area.



Some oceanographers believe it is one of several channels which, in the past, carried mud from land to the Aleutian Abyssal (deep sea) Plain, an area one-half to two-thirds the size of Alaska. The channel is about 3 miles below the surface of the sea.

The plain was cut off from the Aleutian Island Archipelago when a subterranean cataclysm 10 to 50 million years ago caused a segment of the ocean floor--about 50 miles wide and 2,000 miles long--to subside into the earth's crust to form the Aleutian Trench.

#### Channel Discovered in 1967

The existence of the channel became known only last fall. Scientists regard it as containing evidence that may shed new light on the area's geological history. They state that the trench, several thousand feet deeper than the plain to the south, cut off from the plain vast supplies of mud that once flowed through the channels. In its place, the only deposits received by the plain since the trench was formed were airborne dust and remains of living organisms, known as pelagic "snow fall" sedimentation.

#### ESSA Survey

ESSA investigated the sea channel in April. It was a cooperative venture of ESSA's Pacific Oceanographic Research Laboratory, Seattle, Wash., and ESSA's Coast and Geodetic Survey Ship "Oceanographer."



### Government Boosts Nautical Chart Output

During the summer, an estimated 41 million Americans take to the water in boats--many without the nautical charts essential to all navigators.

To meet the rapid expansion in recreational boating, more nautical charts are being turned out to guide these 41 million Americans safely through navigable waters on the Atlantic, Gulf, and Pacific coasts.

A leader in this program is the Coast and Geodetic Survey of the Environmental Science Services Administration (ESSA). This Commerce Department agency produces about 2,000,000 nautical charts a year to

meet recreational and commercial boating needs. The Coast Survey estimates that 223 new charts may have to be produced during the next 10 years.

Conventional charts are used aboard ships where room for display and plotting is available. These charts range from large-scale harbor charts for navigating in harbors and narrow waterways and for anchoring--to small-scale sailing charts for offshore navigation between distant ports.

Small-craft charts are compact and specially designed for cockpit use. They are valuable, too, as hand-held copies on the bridge of large commercial ships. These accordion-folded charts lead skippers to docks, supplies, and services. Printed on the covers are tides, currents, symbols and abbreviations, and many helpful small-craft notes.

#### 2½ Million Sq. Miles Covered

During the past 125 years, the Coast Survey has produced about 850 separate nautical charts covering about 2½ million square miles of navigable waters. "These charts play an important role in the Nation's economic growth and national security. Long-range plans must promote the development of the waterway systems, increased foreign trade, water-related recreation, and the fishing industry to meet the requirements of an expanding population."

This job entails extensive hydrographic surveying along U. S. coasts and estuaries. It includes "the operations of 14 ships, coastal photogrammetric (aerial photo) surveys and mapping; geodetic control surveys; investigations of navigational hazards; nautical chart compilation and maintenance; reproduction and distribution of charts and coast pilot information; and research and development in instrumentation, automation, and cartographic techniques."

Surveying must precede chart compilation, and nautical charts require a great deal of it. This includes hydrographic surveys to chart water depths and bottom topography; wire-drag surveys to find such hidden dangers as pinnacle rocks and wrecks; tide and current observations; and aerial photo surveys to map the coastline. It is estimated that field surveys take two-thirds of each dollar spent to make nautical charts.

#### Need for Charts Grows

The need for up-to-date nautical charts has increased with the expansion of commercial shipping and recreational boating.

The U. S. Coast Guard reported that 3,373 commercial vessels in fiscal year 1966 were involved in marine accidents. Losses reached nearly \$76 million. A total of 534 vessels was grounded.

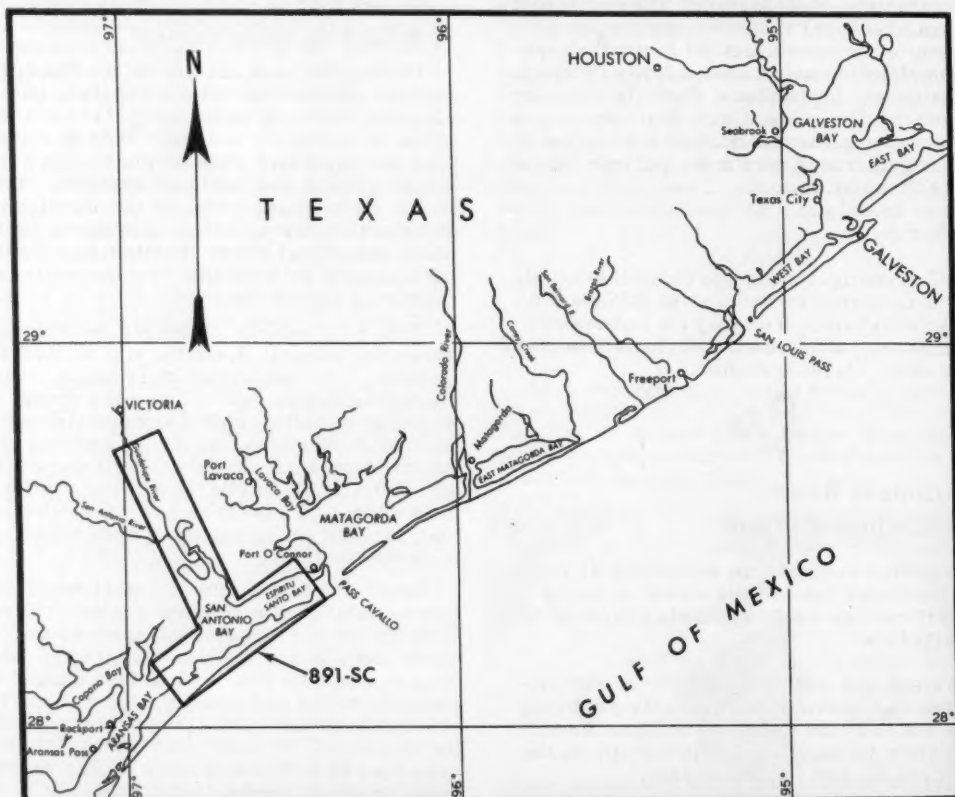
In recreational boating, the number of craft has increased since 1950 from  $3\frac{1}{2}$  million to over 8 million in 1966. The Coast Guard reported 4,350 marine accidents involving 5,567 recreational boats in 1966, losses were \$7,334,500. Of the 4,350 accidents, 283 resulted from groundings.



## Nautical Chart Issued for Intracoastal Waterway in San Antonio Bay

ESSA's Coast and Geodetic Survey has published a new small-craft nautical chart for the Intracoastal Waterway in San Antonio Bay, Texas. The chart includes for the first time the 9 by 100-foot channel from Long Mott to Victoria. This recently completed channel, connecting with the Waterway in San Antonio Bay, extends nearly 35 miles inland to provide water transportation for recreation and industry.

The new chart (891-SC), produced at a scale of 1:40,000, contains the latest marine data, including that obtained in 1967 by aerial photography. It replaces conventional charts 890 and 891 and costs \$1.50.



Area covered by new small-craft nautical chart being issued by the ESSA Coast and Geodetic Survey for the Intracoastal Waterway in Texas.

## Foreign Fishing Off U. S. in May

### OFF ALASKA

**Japanese:** About 140 vessels fished off Alaska during the first half of May--the same number as in April. The pattern of past years was repeated; the number increased to over 400 in second-half May. This resulted primarily from the beginning of the high-seas salmon fishery, and from increased effort in the minced fish meat and fish meal fishery in the eastern and central Bering Sea.

The Pacific ocean perch fishery in the Gulf of Alaska was continued by about 7 stern trawlers during 3 weeks of May. Then the effort dropped to about 5 when 2 moved south to Queen Charlotte Island. The major Gulf activity in May occurred off southeast Alaska in the eastern Gulf.

The perch fishery along the 100-fathom curve in the eastern and central Bering Sea was continued by about 5 stern trawlers during most of May. By month's end, however, the fishery decreased to about 3 vessels--when one transferred to a new herring fishery in the eastern Bering Sea, and another moved south of eastern Aleutians to resume perch fishery. One factoryship, plus 7 trawlers, remained active in central Bering Sea until late May, presumably fishing for ocean perch. At month's end, however, most trawlers were observed fishing for herring in eastern Bering Sea, and it is believed entire fleet had switched to this new fishery.

The trawl fishery for Alaska pollock and flatfish for production of minced fish meat and fish meal was intensified in early May when another factoryship fleet arrived in eastern Bering Sea. This brought to 5 the number of fleets (5 factoryships plus about 88 trawlers). During month, the 5 scattered on Continental Shelf of eastern and central Bering Sea--from just north of Alaska Peninsula to northwest of Pribilofs. Japanese officials reported very good catches being made and, in addition to production of minced fish meat and fish meal and oil, small quantities of fish also are being frozen for human consumption.

The tangle net and pot fishery for crabs in eastern Bering was continued by 2 factoryship fleets. By month's end, both fleets had moved from Continental Shelf just north of Alaska Peninsula to Pribilofs. A similar pattern was followed by the 2 fleets in 1967, and 1 of the 2 fleets in 1965 and 1966. Such moves in pre-

vious years were made primarily because of Soviet competition north of Alaska Peninsula. The Japanese catches this year, like the Soviets', have been predominately tanner crab. The 2 fleets moved to Pribilofs to catch king crab primarily. At least 4 net-setters preceded the 2 factoryships to Pribilofs by 1 month.

The sablefish fishery in Gulf of Alaska was continued by 2 to 4 long-line vessels in May. The major effort was off southeast Alaska coast.

By late May, the Japanese had begun a trawl fishery for herring on the Bristol Bay "flats" about 20 miles south of Togiak Bay. This probably resulted from success of the 3 vessels that searched for herring by fishing with gill nets in central and eastern Bering in April and May. At month's end, at least 12 trawlers and 1 factoryship were fishing. The factoryship and 7 trawlers transferred to this fishery from perch fishery in central Bering.

The 1968 high-seas salmon fishery in North Pacific began in last week of May. As in preceding 6 years, the fishery is being conducted by 11 fleets (11 factoryships and 369 gill-net vessels). The fleets began fishing well southwest of western Aleutians. By end of May, at least half the fleets were working northeast toward the western and central Aleutians.

**Soviet:** About 50 vessels fished off Alaska during first-half May; in the next 2 weeks, their number was lowest since Nov. 1963. Only about 10 vessels remained at month's end--about  $\frac{1}{7}$  number sighted off Alaska in April 1968 or May 1967.

Pacific ocean perch fishing was concentrated along Aleutians; 12 medium trawlers and 2 processing vessels fished south of eastern Aleutians during first 3 weeks, then left. At month's end, only a stern trawler continued to fish for perch south of central Aleutians.

Shrimp fishing on Portlock Bank just east of Afognak Island in central Gulf of Alaska followed the 1967 pattern, when operations began in late March and ended in mid-May. The number of medium trawlers accompanying the 2 Zakharov-class factoryships decreased from 20 in late April to 10 in early May. A BCF agent visited one shrimp-processing floating factory in early May. He was advised

that (1) the medium trawlers had been continually hampered by bad weather since fishery started in March, and so they were not able to achieve planned catch; (2) the shrimp fishery on Portlock Bank would be terminated by mid-May. U. S. fishery patrol units did not find any Soviet vessels on May 14 in the Portlock Bank area.

The trawl fisheries for pollock, flatfish, perch, and gray cod along Continental Shelf edge from Unimak Pass to latitude of St. Matthew Island in central Bering Sea was continued by 15-20 medium trawlers and a few refrigerated transport vessels during first-half May. About mid-May, the number began to decline; by month's end, only about 10 remained active.

Soviet king crab fishing in eastern Bering ended on May 2. A BCF agent who boarded the 2 Zakharov-class factoryships in April was advised that catches were primarily tanner crab; in previous years, such catches were almost entirely king crab. Soviet officials said that if catches did not improve, and if tanner crabs continued to dominate, they would abandon crab fishery much earlier than planned date of late June. The Soviet withdrawal from eastern Bering by May 2 indicates that tanner crab continued to prevail. The Soviets apparently believed the 2 fleets could be used more economically elsewhere.

Two whaling fleets began North Pacific whaling in mid-May. No vessels had been observed near Alaska by month's end; apparently, the fleets are remaining well offshore.

South Korean: After attempting to enter North Pacific fisheries off Alaska in fall 1967, the fleet of "Sam Su No. 301" accompanied by

6 small pair trawlers returned in early May. The fleet proceeded eastward along Aleutians to Unimak Pass, then sailed northwest to central Bering. At month's end, the South Korean fleet was located on or along edge of Continental Shelf west of St. Paul Island. Presumably, it was fishing for flatfish, Alaska pollock, and ocean perch. The expedition had difficulties. Part of the fleet experienced mechanical difficulties, one trawler ran aground, and 2 narrowly missed severe damage when they hit icebergs.

#### OFF PACIFIC NORTHWEST

Soviet: During May, 56 individual vessels were sighted off Washington and Oregon, compared to 54 vessels in April 1968. Because not all fished entire month, weekly average off Pacific Northwest fluctuated between 35 and 45 different vessels through May (see table). This is considerable decrease from average number observed in 1967, when over 100 were sighted each week.

It was not until week ending May 23 that commercial quantities of fish were observed on Soviet vessels. A side trawler off Oregon had good-to-excellent catches of Pacific hake. Most side trawlers were observed catching up to 10,000 pounds per haul; a couple of pair trawls contained about 75,000-100,000 pounds--mostly hake.

During 4th week, part of fleet moved north off Grays Harbor, Wash. There, and off Heceta Head, Oregon, good-to-excellent catches (primarily hake) also were observed.

Off Oregon, 2 stern trawlers completed hauls of about 60,000 to 80,000 pounds of hake. Several stern trawlers had side bins full of what appeared to be hake.

Soviet Fishing Vessels Sighted Off U. S. Pacific Northwest in May 1968							
Week Ending	Area	Type of Vessel					
		Medium Side Trawlers	Stern Factory Trawlers	Support Vessels	Research Vessels	Other	Total
May 9	Wash.	1	-	-	1	1 tug	3
	Oregon	21	13	6	1	1 tanker	42
	Total	22	13	6	2	2	45
May 16	Wash.	-	-	-	-	1 tug	0
	Oregon	17	6	7	2	1 tanker	34
	Total	17	6	7	2	2	34
May 23	Wash.	1	-	-	-	1 tug	1
	Oregon	14	13	5	2	1 tanker	36
	Total	15	13	5	2	2	37
May 30	Wash.	11	-	5	-	1 tug	16
	Oregon	4	15	2	2	1 tanker	25
	Total	15	15	7	2	2	41



During May, the Soviets had 3 medium trawlers off Pacific Northwest. These are probably vessels searching for fish concentrations for the fleet.

#### OFF CALIFORNIA

Soviet: Foreign fishing decreased during May. Poor weather prevented routine aircraft patrol early in the month, when the Coast Guard reported 8-10 unidentified Soviet vessels off Santa Cruz. During week ending May 17, 7 factory trawlers were sighted fishing 18-20 miles off Russian River. During week ending May 24, only 2 vessels were sighted.

The research vessel "Druzhnii" again came to Los Angeles Harbor from May 22-26 to take on fuel and supplies. This vessel, an ex-whaler, reportedly is conducting oceanographic research off Central and South America.

#### IN NORTHWEST ATLANTIC

An estimated 250 foreign vessels from USSR, Poland, East Germany, and Japan were sighted off U. S. coast in May--a slight increase over number reported in April 1968. The Soviets had the most vessels, averaging between 120 and 130; during one week, they reached 150.

207 individual Soviet vessels were sighted and identified in May; in April, 188.

32 Polish vessels and 9 East German vessels also were sighted.

Two Japanese stern trawlers were intermittently reported off the U. S. coast.

Soviet: Through May, the main fleet was divided into large groups generally dispersed from south of Block Island, R. I., to southwest slopes of Georges Bank. More vessels began fishing those areas in early May, when Soviets suddenly shifted many vessels from mid-Atlantic (off New York and New Jersey) eastward.

Early in May, about 150 Soviet vessels were in a 30-mile area 30-40 miles south of Block Island and Martha's Vineyard. Moderate catches of fish visible on deck appeared to be mostly herring, with some whiting and red hake. By mid-month, fleet shifted to nearby area south of Nantucket Island to

southwest part of Georges Bank. Observed catches were primarily herring and whiting. By month's end, an estimated 140 vessels were dispersed along eastern slopes (southwest and southeast parts) of Georges Bank fishing in 30 to 40 fathoms, primarily for herring.

#### OFF MID-ATLANTIC

Soviet: In May, 50-60 vessels fished primarily off New York and New Jersey; 100 had been sighted in April. The decrease was caused by shifting operations to southern New England and Georges Bank area.

Early in May, about 40 vessels were spread out from about 40 miles east of Atlantic City, N. J., to 30 to 70 miles south of Long Island. Catches seen on board were mostly herring, with some whiting and red hake. By mid-month, 60 vessels were in Hudson Canyon area 60-70 miles south of Long Island; several vessels were also scattered east of Cape May, N. J. Catches were mostly herring. By month's end, 50 vessels were sighted in a 20-mile area 50 miles south of Montauk Point, L. I.; several vessels were also fishing near Hudson Canyon. Catches on board were primarily herring.

Polish: During May, 25-30 vessels were sighted fishing off New York, New Jersey, and southern New England. Early in month, an estimated 25 were 20 to 40 miles south of Montauk Point and Block Island, R. I. By mid-month, 15 to 20 vessels fished east of New Jersey and south of Long Island. By month's end, those vessels were scattered from New York to eastern slopes of Georges Bank. Herring was primary catch observed.

East German: In May, 6-7 East German vessels (side trawlers) continued fishing among Polish and Soviet fleets. Catches on board were identified as herring.

Japanese: Early in month, 2 stern trawlers were reported fishing off New York and New Jersey. Late in month, those vessels were sighted on southwest part of Georges Bank. Japanese press reported that by end of May 8 to 9 trawlers were expected to be "exploring" off U. S. east coast, specifically off New York and New Jersey. Apparently, the arrival of some of those vessels has been delayed.

## IN GULF OF MEXICO AND OFF SOUTH ATLANTIC

No foreign vessels were sighted during May fishing off the U. S. Atlantic coast south of Cape Hatteras (including off Florida coast) or off U. S. Gulf of Mexico coast.

Note: During surveillance patrols, a certain number of vessels is sighted. The total is recorded; also, each vessel is identified as to type. At month's end, all sighted vessels are counted only once. If a vessel was sighted more than once, it will be counted only once. Since vessels arrive at and depart from fishing areas all the time, the total of identified vessels for the month always will be larger than actual size of fishing fleets observed during individual surveillance patrols.



### CRAB DABS



1 can (12 ozs.) Dungeness crab meat or  
other crab meat, fresh or frozen or  
2 cans (6½ or 7½ ozs. each) crab meat  
½ cup fine soft bread crumbs  
2 tablespoons dry sherry

1 teaspoon chopped chives  
1 teaspoon dry mustard  
¼ teaspoon salt  
10 slices bacon, cut in thirds

Thaw frozen crab meat. Drain crab meat. Remove any remaining shell or cartilage. Chop the crab meat. Combine all ingredients except bacon. Mix thoroughly. Chill for 30 minutes. Portion crab mixture with a tablespoon. Shape into small rolls. Wrap bacon around crab rolls and secure with a toothpick. Place crab rolls on a broiler pan. Broil about 4 inches from source of heat for 8 to 10 minutes or until bacon is crisp. Turn carefully. Broil 4 to 5 minutes longer or until bacon is crisp. Makes approximately 30 hors d'oeuvres.

This idea for entertaining is from a new, 22-page, full-color booklet, "Nautical Notions for Nibbling," released by the United States Department of the Interior's BCF. It is available for 45¢ from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Ask for Market Development Series No. 10, (catalog no. I-49.49/2:10).

## STATES

### Alaska

#### SURVEY SHOWS SHARP CONTRAST IN SCALLOP ABUNDANCE

The Federally aided, State-chartered exploratory fishing cruise to determine the commercial feasibility of an Alaskan scallop fishery ended June 6, 1968, at Kodiak. In 40 days of fishing, the F/V "Viking Queen" made 472 one-half hour drags using 2 standard New England dredges each 13 feet wide. She fished the area between Lituya Bay and Cape Saint Elias along the east coast of the Gulf of Alaska, the vast flats off Prince William Sound between Hinchinbrook, Montague, and Middleton Islands, along the southeast shore of the Kenai Peninsula and the entrance to Cook Inlet, and around Kodiak Island.

#### The Results

The cruise results indicate sharp contrasts in scallop abundance, with the dividing line near Cape Saint Elias. Eastward of Cape Saint Elias, the Viking Queen found scattered beds capable of supporting commercial operation--but none to the westward.

Over 200 drags were made in Lituya Bay-Cape Saint Elias area. Scallops appeared to be most abundant along the coast east of Yakutat Bay, where 100-bushel catches were made. Based on 6 hours' production fishing on a bed near Yakutat, Captain Ness of the Viking Queen estimates he can produce 4,000 pounds of scallop meats per day in this area with a full 11-man crew fishing round the clock.

#### Kodiak Catches Disappointing

The Viking Queen catches in the Kodiak area proved disappointing. Earlier landings by Kodiak fishermen suggested an apparent abundance of scallops. The Viking Queen made 110 drags around the Island from Cape Uganik to Marmot Bay--and found no large concentrations. Most drags produced few or no scallops. The Marmot Flat bed, pioneered by the "Virginia Santos," proved to be small and apparently already depleted.

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### HYDROLOGY OF ESTUARIES STUDIED

Small bays and inlets abound in southeastern Alaska and serve as spawning and nursery areas for many species of commercially important fish. BCF's Auke Bay Laboratory and the Alaska Water Laboratory of the Federal Water Pollution Control Administration are making a joint study of several of these bays to determine the extent and intensity of natural and man made changes in oceanographic conditions. These changes can drastically affect the biological productivity of the bays.

#### 2 Estuarine Bays Surveyed

Two estuarine bays that are affected by pulp mill discharge were surveyed recently--Ward Cove near Ketchikan and Silver Bay near Sitka. The work is aimed at determining the detailed oxygen budget of the estuaries, mapping the bottom sediments, and measuring the effects of pulp mill discharge on the intertidal fauna. The two bays are significantly different in hydrology, and the study will provide comparative data on the susceptibility of the bays to pollution. The data from Silver Bay can also be compared with data collected in 1957 before the pulp mill went into operation.



### California

#### 1968/69 ANCHOVY REDUCTION FISHERY SEASON PROPOSED

The California Fish and Game Commission intends to adopt a 1968/69 anchovy reduction fishing season of 75,000 tons, the same as 1967/68. It scheduled a hearing in San Diego for July 26.

The proposed season would have 3 zones instead of 6. The dates would be changed from the previous season. The reason for the proposed fewer zones is that tagging studies have shown that anchovies migrate between S. California and Central California, between S. California and Baja California and inshore to offshore; thus the current zones were of little value.



### Proposed Fishery

The proposed fishery would have 1 northern zone, north of Point Conception, with a 10,000-ton quota, and 2 southern zones instead of the 5 in the 1967/68 season. The total quota for the 2 southern zones would be 65,000 tons--15,000 in inshore zone and 50,000 for offshore.

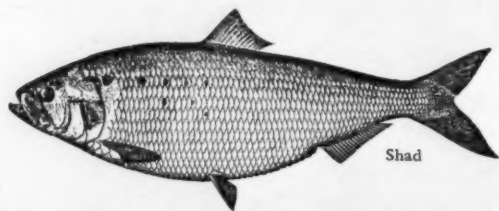
A smaller inshore quota is proposed to reduce competition in the area of heaviest sportfishing. The northern season would be August 1 through Memorial Day; the Southern from Labor Day through Memorial Day. The Department of Fish and Game recommended that the Commission consider raising the quota if commercial fishermen reach the 75,000-ton allotment during the season. It estimates the anchovy population in California waters at the minimum of 2 million tons.



### Oregon

#### COLUMBIA RIVER SHAD NEARING CENTENNIAL

The Oregon Fish Commission has recorded the story of the nearly-century-old American shad. The fish first appeared in the Columbia River in the late 1870's. It came from a stock introduced into California's Sacramento River from the Atlantic Coast in 1871. In 1885, about 1 million shad fry from the Susquehanna and Potomac Rivers were released into the Columbia, Willamette and Snake Rivers.



Since then, the shad runs have fluctuated considerably. The bulk have spawned below Bonneville Dam. In recent years, however, dams have changed the river environment. The shad extended their range into the upper Columbia and Snake Rivers. Since 1960, annual passage over Bonneville has exceeded 200,000.

The Columbia has become one of North America's largest shad producers. The potential commercial harvest was 2-4 million pounds in recent years. Despite this abundance, commercial shad landings since 1938 have ranged from a high of about 1.4 million pounds in 1946 to a low of 136,000 pounds in 1959.

### Fishing Restrictions

Before 1953, "there were no season restrictions on commercial shad fishing, although meshsize restrictions were enforced during the closed period between the spring and summer commercial fishing seasons. Since then, however, the fishery has had problems: summer chinook salmon.

In 1955, shad fishing was prohibited between normal salmon seasons except in Camas-Washougal area. This was not to "protect" summer chinook. It was designed to raise early-summer chinook escapement by eliminating incidental catch during shad season--so the regular summer commercial fishing season could begin.

The present restrictions on the shad fishery aim to protect dwindling summer chinook numbers. The restrictions began to develop after 1957, the year of the largest summer chinook run since 1938. After 1957, the run declined steadily:

1957-200,000	1964- 91,000
1958-187,000	1965- 76,000
1959-170,000	1966- 72,000
1960-143,000	1967- No precise estimate due to early end of spring commercial fishing season.
1961-130,000	This resulted in large-scale mixing of spring and summer chinook.
1962-108,000	
1963-100,000	

### Hydroelectric Installations

This decline is directly related to hydroelectric installations. These limited severely and, in some cases, eliminated races of fish by "blocking spawning runs, inundating spawning areas, delaying migrations, and creating mortalities to both upstream and downstream migrants."

The Fish Commission first became concerned about the upriver runs and the increasing interdam problems in the late 1950s. But at that time the losses hadn't seriously affected sport or commercial fisheries.

Later, the number of dams increased rapidly--and the number of fish in the upriver

runs generally decreased. By 1953, the decline in summer chinook had become serious. The Fish Commission and Washington Department of Fisheries biologists recommended a reduced 1964 summer commercial fishing season. More research in 1963 and early 1965 substantiated the summer chinook's plight. But it took a 70% interdam loss of the 1965 spring chinook run between Bonneville and Ice Harbor-Priest Rapids Dams to point up the commission's concern about problems between the dams.

In 1965, the Fish Commission and the Washington Department of Fisheries recommended no summer commercial fishing season. They requested an end of sport fisheries in Oregon, Washington, and Idaho. (The Indian fishery continued, harvesting about 9,000 summer chinook.)

#### Experimental Shad Season

An experimental shad season was started in 1965 at the request of the commercial fishing industry. It was limited to the upper 13 miles of the regular commercial fishing area below Bonneville Dam. To protect the summer chinook, possession of salmonoids during the fishery was prohibited.

The incidental catch of summer chinook was minimal. However, fishermen harvested only 68,400 shad from a run estimated at 700,000 fish minimum (catch plus Bonneville count).

In 1966, sport and commercial closures on summer chinook continued throughout the 3-state area. The experimental shad fishery was expanded to include 60 miles of fishing area; fishing time was extended.

Nearly 165,000 shad were harvested from the run estimated at about 700,000 (catch plus Bonneville count). However, nearly 6% of the total catch was salmon and steelhead. This increase was attributed partly to increase in night fishing, when salmonoids apparently are more vulnerable to shad nets.

#### Closures in 1967

The summer chinook sport and commercial fishing season closures continued in 1967. Night fishing for shad was eliminated and gear restrictions increased. Despite this, biologists found that incidentally caught salmonoids were nearly 6% of total catch. About

230,000 shad were landed. Nearly 10,000 summer chinook were caught and released. The biologists estimated, however, that 24% of the chinook were dead when removed from nets. The chinook catch was greatest during the week of highest roe shad landings.

Based on historical data and daily monitoring of shad fishery in '65, '66, and '67, biologists concluded that a maximum harvest of shad could not be taken by gill nets without catching large numbers of chinook. Also, that increased protection of chinook would be difficult because shad and chinook reach peak in fishing area about the same time.

So, on January 31, Fish Commission and Washington Department of Fisheries biologists recommended that there be no shad fishery in 1968, except in Camas-Washougal area, where few salmon or steelhead are caught. Also, research should begin in 1968 to find new ways of harvesting shad--seines, traps, etc.

#### Fishermen's Views

Commercial fishermen recommended that no action be taken to end the shad fishery at the January meeting. They believed they could develop gear restrictions that would virtually eliminate the incidental catch of summer chinook--and still harvest many shad. The joint commission deferred action.

At the March 27 commission meeting, industry spokesmen presented gear restrictions developed jointly by packers, fishermen, and net companies. The restrictions were to make the gill net hang in the water as a straight wall without folds or slack. With the net hung "tight," salmon would easily break through fine mesh. The spokesmen recommended a season to test the gear restrictions from June 5 to July 15 during daylight only; possession of all salmonoids was to be prohibited.

#### The Test

The commission later set a 4-day season to test these gear recommendations for reducing the high incidental take of chinook salmon. The season began June 10 and ran through June 13 from Gary Island upstream about 17 miles to the commercial fishing deadline 5 miles below Bonneville Dam.

Biologists monitored the fishery. They estimated the catch at 21,000 shad, 700 chinook, 44 steelhead, and 29 sockeye. All salmonoids were returned to the river.

Based on these observations and previous data, the two agencies concluded that the gear restrictions did not reduce substantially the incidental summer chinook catch--and probably reduced the shad catch. At the June 14 public hearing, they recommended no further gill-net fishing for shad in the Columbia River, except in the Camas-Washougal area.

They emphasized the need for research to develop shad fishing gear that would protect summer chinook--and be more effective in harvesting large numbers of available shad.

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#### SHAD AND STRIPED BASS ARE TAGGED IN STUDY

Shad and striped bass are being tagged in Coos Bay by Oregon Fish Commission biologists who want to learn about the life histories of these important food and sport fish. These fishes spend part of their life cycle there. So far, several hundred have been marked with yellow plastic "spaghetti" tags.

The Commission's Charleston Research Laboratory appealed to fishermen to turn in tags with a note giving date and specific area of catch.

The study is being financed partially with Federal funds available to the state under the Anadromous Fisheries Act, Public Law 89-304.

The Commission is continuing its collection and analysis of information on the "commercial catch, fishing intensity, age composition of the runs, sex ratios, spawning history and work on juvenile ecology" on the Siuslaw, Umpqua, Smith, and Coquille Rivers.



## Washington

### OCEANOGRAPHIC COMMISSION SPONSORS SEAMOUNT STUDY

The Oceanographic Commission of Washington will sponsor a program to place a manned habitat and researchers on Cobb Seamount off the Washington coast in summer 1969. Called "Project Sea Use," the program calls for explorations during summer 1969 to prepare for a multipurpose ocean laboratory.

Cobb Seamount is a volcanic mountain in the Northeast Pacific Ocean 270 miles due west of Grays Harbor, Wash. It rises from a 9,000-foot deep basin to within 122 feet of the surface. It rises closest to the surface of any of the seamounts in the Northeastern Pacific, within the zone penetrated by sunlight.

Though it lies nearest to the United States it still is a basically undisturbed deep-ocean environment. Discovered in 1950, the mount has stimulated much interest. Many believe it is a regional resource with "great potential significance for scientific exploration, development of new marine engineering applications and eventual operational utilization."

Project Sea Use will seek to accomplish these objectives:

- "Characterize the chemical, physical, geological and biological features of the seamount and its environs.
- "Demonstrate that man can occupy, perform meaningful scientific work and do underwater construction at a seamount far distant from land based support and facilities.
- "Use presently available deep ocean technology in integrated support of a scientific program."



## BUREAU OF COMMERCIAL FISHERIES PROGRAMS

### 'Undaunted' Finds Many Tunas on W. African Cruise

BCF's R/V Undaunted returned to Miami, Fla., on May 21 after a successful cruise to West Africa. (Cruise 6801, Jan. 9-May 21, 1968.) She found excellent tuna fishing throughout most of the cruise.

Open houses and press conferences were held at Freetown, Sierra Leone; Accra, Ghana; and Abidjan, Ivory Coast.

The Undaunted's missions were: 1. Investigation of the distribution and biology of surface tunas and other open-sea fishes--with measurements of the physical and biological environment. In particular, investigation of tuna distribution in the Gulf of Guinea and off Angola in relation to the oceanographic features of the Berrit Front and the Angola Dome.

2. Investigation of the distribution and biology of fishes suitable for use as live bait for tuna fishing.

3. Collection of bottom-dwelling fishes and invertebrates from the continental shelf off Angola and southwest Africa.

#### TUNA SURVEYS

The tuna fishing was excellent throughout most of the cruise: 88 tuna schools were sighted or detected by trolling catches. During Tuna Survey I (Feb. 18-25), 72 skipjack (*Katsuwonus pelamis*) and 3 yellowfin tuna (*Thunnus albacares*) were caught on jig lines and sampled for length, weight, sex, stomach contents, viscera, muscle tissue, and eye ball. Most skipjack were small (2-3 lbs.). Weather in the survey area (fig. 1) was excellent, and the behavior of the tuna schools sighted was judged acceptable for purse seining. The schools were not fished with live bait.

During the Frontal Survey (March 3-16) 11 tuna schools were sighted or located by trolling in 13 days. These were generally located close to the 24° C. isotherm (fig. 2). Two schools were fished using live bait. A total of 125 skipjack (2-3 lbs.) was sampled, 100 from one school. Two 35-pound yellowfin tuna were caught on sport tackle in the Baía

dos Tigres (17° S. Lat.). The bay is shallow, and the water was dirty green. The weather was generally poor with low visibility and rough seas, and tuna sighting and fishing were severely hampered.

#### Excellent Fishing

Numerous tuna schools, combined with excellent weather, produced excellent fishing during Tuna Survey II (April 13-26). The scientists sampled 341 skipjack and 116 yellowfin tuna from 41 schools sighted. Seventeen schools were fished, using live bait. Tuna were particularly abundant around São Tomé Island (fig. 1). As many as 6 schools were sighted in a single day. Most were small (3-5 lbs.) skipjack. Whales and birds were also numerous. One school of yellowfin tuna, averaging 12 pounds each, was worked just a few miles from São Tomé; 74 fish were sampled from this school. Most of the larger skipjack (6-8 lbs.) in the area were in advanced stages of maturity. Ovaries had large, clear eggs with well defined oil globules; the testes extruded milt on cutting and squeezing.

Most schools sighted seemed suitable for purse seining, although many skipjack were less than 4 pounds and below the size acceptable to American cannerys. No commercial tuna boats were sighted during the cruise, although local bait boats were reported fishing skipjack out of Lobito and Mossamedes, Angola, with good success.

#### BAITING RESULTS

Good quantities of bait were located at Cabo Ledo, 60 miles south of Luanda, Angola, and in the harbor at Lobito.

In 3 sets at Cabo Ledo, 150 scoops were captured. *Sardinella eba* was the most abundant species; *Chloroscombrus chrysurus*, *Ethmalosa fimbriata*, and *Trachinotus glaucus* were also present. Survival of *S. eba* was excellent, but the *Chloroscombrus* died within 3 days.

At Lobito, 150 scoops of bait, almost exclusively small (2-3") *S. eba*, were captured. Survival was excellent. Baiting was unsuccessful at Freetown, Sierra Leone, and Luanda.

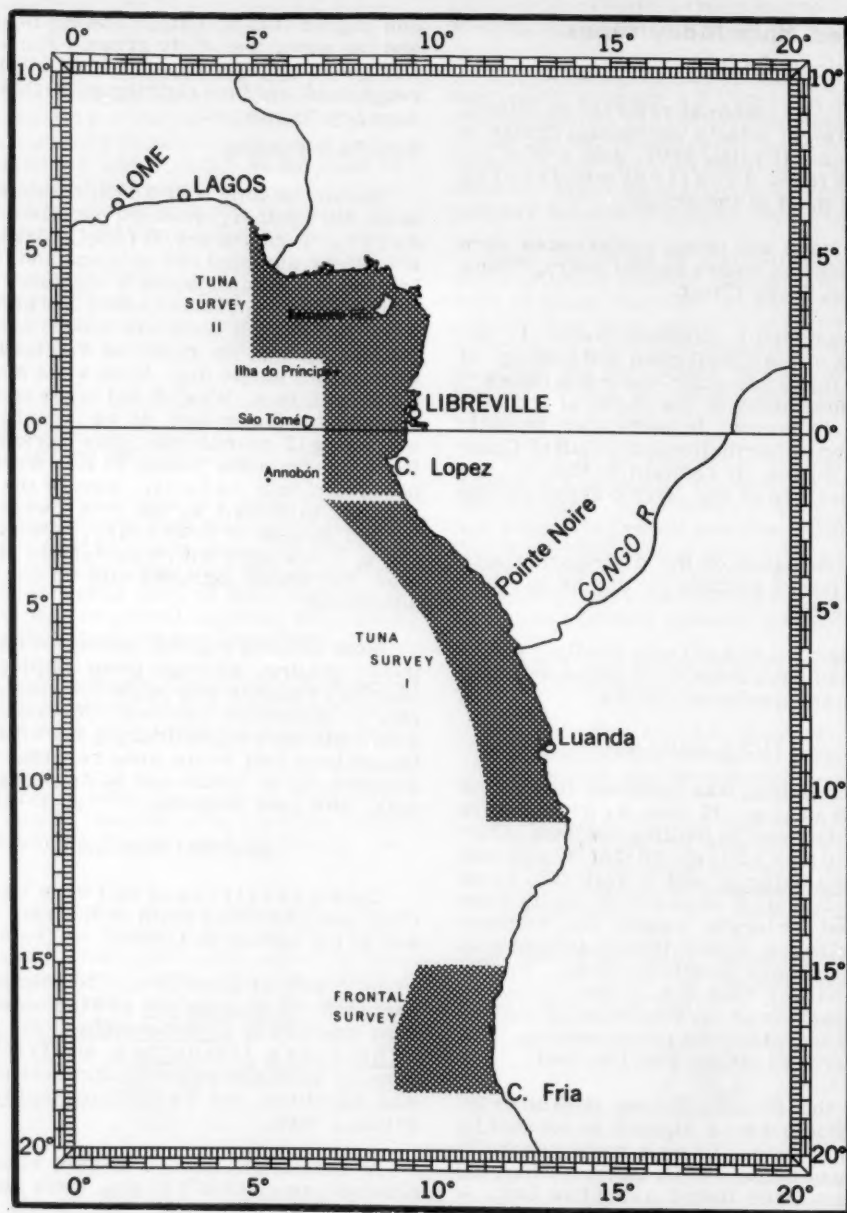


Fig. 1 - Survey areas, UN-6801.



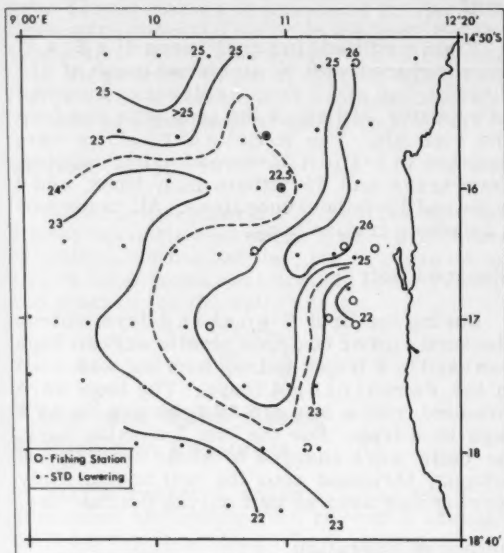


Fig. 2 - Surface isotherms, Mar. 3-Mar. 16.

#### FRONTAL SURVEY

After baiting at Cabo Ledo on March 2, a southerly course was followed to intercept the Berit Front. Surface water temperature was monitored by a continuous recorder. No abrupt change in temperature was noted. At 17° S. Lat., temperature of 23.5° C., station grid was set up to survey the general area where the front was supposed to be located during this period. Oceanographic observations (temperature, salinity, inorganic phosphate, iron, and oxygen) were made to a depth of 500 m. with a salinity-temperature-depth probe (STD) and Niskin water samplers. Duplicate, oblique, 1-meter plankton net tows from the depth of the thermocline to the surface were made at all hydrographic stations. Single plankton net tows were made at all fishing stations. Primary productivity and meteorological observations were also taken.

Surface temperature plots revealed the front to be S-shaped, with the lower part beginning at about the Baia dos Tigres (fig. 2). The position and shape of the front agreed with previous observations by other workers.

#### TRAWLING SURVEY

The trawling portion of the cruise was terminated after 3 days because the engine

needed repair. Of five planned transects, 1½ were completed. Seventy-five gallons of fish were preserved. Crustaceans and other invertebrates were dispensed to specialists actively working on African species.



#### 'Undaunted' and ESSA's Weather Satellites to Pioneer Ocean Study

When BCF's Undaunted sails from Miami, Fla., on August 5 for the west coast of Africa, she will sail a charted course. But after she arrives there, she will help to pioneer an uncharted course: she will work with ESSA's weather satellites to see if data gathered by the satellites can be useful to fishermen and oceanographers in locating an oceanic "front." If the mission is successful, it could lead to the prediction of favorable fishing conditions and to larger catches.



The R/V Undaunted. (Photo: Jossi, TABL.)

The Undaunted is the first fishery research vessel to join with satellites to determine whether it is practicable to monitor oceanic fronts from the skies. Such fronts are present in some areas of the world and constitute boundaries between masses of water. The fronts seem to be instrumental in concentrating fish that school on the surface; the tuna is one of these.

#### The Operation

The Undaunted will use her conventional equipment to collect data on fish, the ocean, and weather conditions. In addition, she will have an automatic picture transmission (APT) receiver aboard. The satellites, orbiting the earth at about 700 miles, will transmit daily APT meteorological photos.

A single photograph by satellite could cover an area that would take an oceanographic vessel days or weeks to cover. Ordinarily, a research vessel stops fairly often to sample marine life and water. Together, the Undaunted and the satellites would be a quicker and more effective way of studying the ocean.

The Undaunted is part of BCF's Tropical Atlantic Biological Laboratory (TABL) in Miami. Dr. Paul M. Maughan of Washington, D. C., and Dr. Merton C. Ingham of TABL are BCF leaders of the project.

#### Undaunted's Other Missions

In addition to her work with the satellites, the Undaunted will investigate the distribution of surface schooling tunas in relation to oceanic, physical, chemical, and biological factors. She will provide specimens for biological studies. The vessel also will investigate the distribution and biology of fishes suitable as live bait for tuna fishing, and will collect bottom-dwelling fishes and invertebrates from the west African continental shelf.



#### Use of Traps to Capture Halibut Under Study

The charter vessel M/V "Commando" returned to Seattle, Wash., on June 10, 1968, after a 10-day halibut gear research cruise (No. 11) between Scott Islands and Hecate Strait. Due to the absence of halibut, only part of the mission was accomplished.

The cruise's major objective was to determine the feasibility of using traps, or pot-type gear, to capture Pacific halibut in commercial quantities. Other aims were to (1) compare catch rates of trap gear with those of commercial longline gear fished in the same area; (2) determine the optimum soaking time of baited traps; (3) compare suitable baits for taking halibut with traps.

#### Conclusion

Halibut can be captured with traps. Absence of halibut in the Goose Island area prevented evaluation of trap efficiency compared to longline gear. Therefore, the study of the effectiveness of traps for capturing halibut in commercial quantities--and the most suitable baits to use--is inconclusive.

#### Gear

Eight modified king crab traps 8' x 6' x 3' were covered with 9<sup>1</sup>/<sub>2</sub> stretched mesh of 21-thread nylon and 2 tunnel entrances mounted on opposite sides of the trap with one fore and one aft. The tunnel entrances were mounted in 3-inch 36-thread nylon webbing. Four traps had 65-fathom buoy lines, and 4 traps had 83-fathom buoy lines. All traps had a 3-fathom trailer buoy.

#### Blackcod Bait

During the first 3 soaking days, cut-up blackcod inserted into plastic screen bags was used in 4 traps; cut-up herring was used in the remaining 4 traps. The bags were threaded with a steel bait hook and hung 2 bags to a trap. For the last 2 soaking days, the baits were changed to whole herring and octopus, threaded onto the bait hooks. Only herring was used as bait during the last day.

#### Method of Operation

Traps were set about one-half mile apart in 2 rows in 3 different locations: (1) Southwest corner of Goose Island Bank in 25-35 fathoms; (2) Northwest corner, Goose Island Bank in 52-61 fathoms; (3) between Scott Islands and Cook Bank at 52-54 fathoms. Traps were lifted after soaking 6 hours, 12 hours, and 22 hours, and were rebaited with fresh bait after soaking for 22 hours.

One skate of longline gear with 120 hooks was baited with octopus and herring and set between the 2 rows of traps. The gangion lines were spaced about 3 fathoms apart.

#### Results

Two halibut, 78 cm. and 108 cm., were taken in separate traps baited with whole herring threaded onto bait hooks. One large petrale sole was taken in a trap baited with cut-up herring in a plastic screen bag. No halibut were taken with the longline skate of gear or handlines. Two commercial halibut vessels were observed and only one halibut was taken during observation. No other halibut vessels were seen.

#### Herring Baited Traps

Herring-baited traps captured the 3 fish taken. The bait (herring) needed replacing after soaking 22 hours because small fish or



sand fleas had eaten much of it. No sand fleas were observed on or in the bait, but the appearance of the eaten bait would indicate sand fleas were present. Cut-up bait in the fine-webbed plastic screen bags was untouched by sand fleas or small fish.

#### Weather

Weather was generally good. The sea was choppy as northwest winds from 20-30 knots prevailed. On the last day, the sea was calm, and the large traps were brought aboard easily and stacked for the return trip.



### 'Cisco' and 'Kaho' Assess L. Michigan Resources

BCF's research vessels Cisco and Kaho concluded the spring 1968 resource assessment survey in southern Lake Michigan during May. (Cisco Cruises 1 & 2, 1968, Kaho Cruise 47.) Primary objective of the study was "to determine the relative abundance, condition, and seasonal movements of alewife and other important fish stocks in the southern portion of the lake."

The researchers emphasized collection of biological data on alewives during their normal inshore spawning run to better determine the

status of year class stocks; also, to monitor conditions as the summer die-off period approaches.

Besides collecting important life-history data on the alewife and other commercial species, the Kaho also sampled adult alewife populations at established stations. This was done to compare production rates with those of previous years--and to be better able to predict their availability to commercial fishermen.

Extensive echo-sounding surveys were made in southern L. Michigan to pinpoint the location of large concentrations of alewife. This information is important to fishermen who supply pet-food and fish-meal plants--and to industrial water users who have faced the problem of live alewife clogging water intakes during their spring spawning migrations.

#### What Vessels Found

In general, alewives were found in extremely dense concentrations, which were limited in size and moved in and out of an area. Commercial trawlers provided evidence of scattered and mobile concentrations reflected by daily catches. For a day or two, catches were exceptional, then the following day or two produced moderate or very poor catches. Catch rates of adult alewife with the Kaho's standard 52-foot (headrope) trawl were

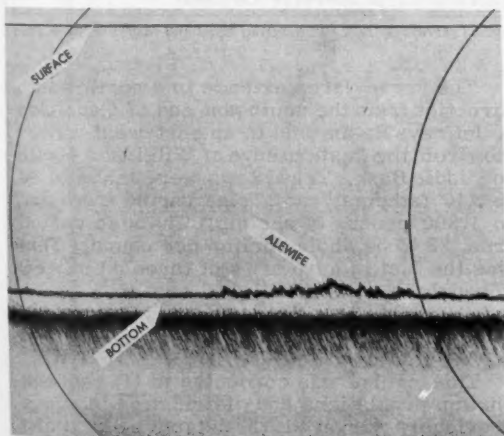


Fig. 1 - High-resolution "white line" echo sounder recording (left) showing alewife concentration on the bottom in 20 fathoms of water off Waukegan, Illinois, on April 13, 1968. Some 11,000 pounds of alewives (right) were taken in a 15 minute trawl drag which was in this concentration about eight minutes. Note that concentration of alewives was so dense that top of school produced "white line" effect which usually is caused by the bottom only.

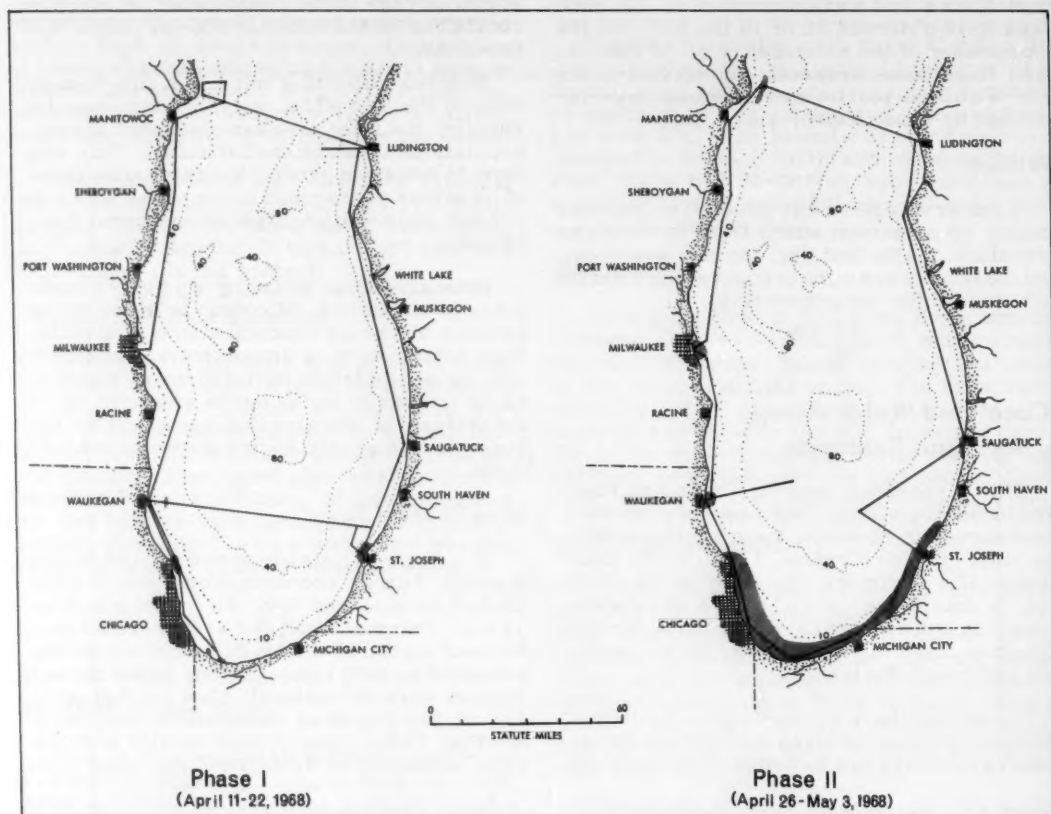


Fig. 2 - Track lines of the resource assessment echo-sounding and sampling surveys by R/V Kaho during April and May 1968. Shaded areas indicate bottom concentrations of alewives.

roughly comparable to those in 1963 and 1964. Sampling with a standard small-mesh trawl by both Cisco and Kaho on both sides of the lake revealed extremely abundant yearling alewife (1967 year class).



### 'Delaware' Finds Many Northern Shrimp

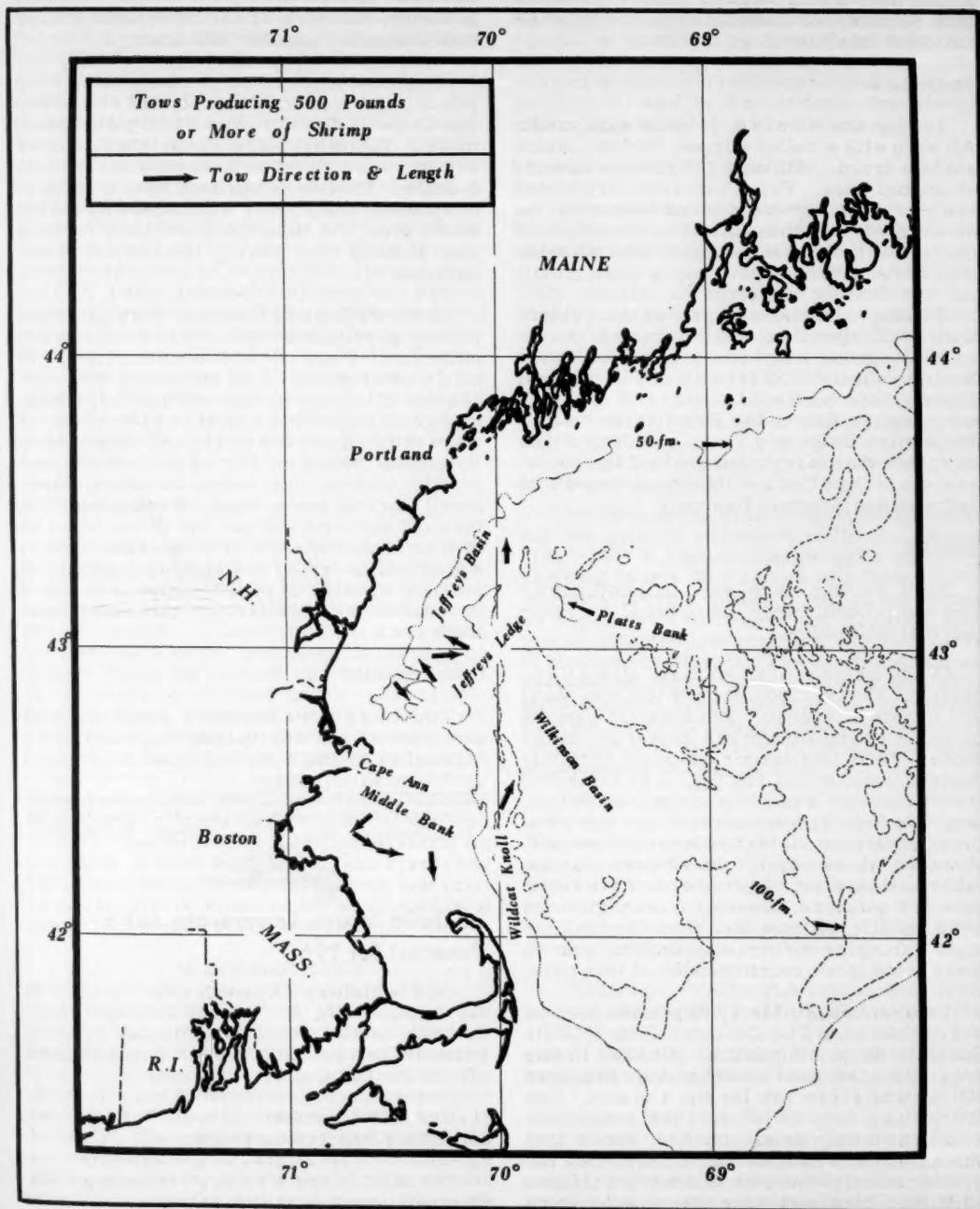
Extensive populations of northern shrimp (*Pandalus borealis*) were found in waters of the western Gulf of Maine.

BCF's Delaware returned to Gloucester, Mass., on May 17 after a spring resurvey for shrimp in areas explored Nov.-Dec. 1967 and Jan.-Feb. 1968 (Del. 68-4, May 8-17, 1968).

The survey area extends in a north-south direction from the southeast end of Cape Cod to Jeffreys Basin, and in an east-west direction from the western edge of Wilkinson Basin to Middle Bank. Trawl tows were made in 40 to 140 fathoms; catch size varied from one to 1,300 pounds of shrimp. The size varied from 33 to 50 whole shrimp per pound. This was the last in a series of three cruises scheduled for the 1967/1968 season.

### Purpose

This cruise was conducted to (1) recheck shrimp populations and distribution in areas previously surveyed; (2) determine kind and extent of any population changes that may have occurred, and their effects on the availability of shrimp to commercial fishing in this area



at this time of year; and (3) collect biological data pertinent to possible commercial utilization of this resource.

### Procedure

During the cruise, 51 tows were made. All were with a roller-rigged, 70-foot, Maine shrimp trawl. All were 60 minutes except 2 shortened ones. These two were terminated early when a hang-up occurred soon after the hook-up for one tow, and when the nature of the bottom became untrawlable after 40 minutes of the other tow.

Fishing operations began on the western tip of Stellwagen Bank and progressed northward along the western edge of Wilkinson Basin to about the latitude of Platts Bank. Fishing then continued southward along the northeastern side of the Basin to between Fippennies Ledge and Sharrer Ridge. From this point, the survey continued off the southeast end of Cape Cod and then progressed into Jeffreys and Scantum Basins.

### Results

Most shrimp taken were in a soft condition and probably were not optional for commercial utilization.

Of the 50 completed tows, all caught shrimp. The average catch per tow was about 276 pounds of shrimp. Ten tows (20 percent of total) produced catches of 500 pounds or more. While this catch rate would certainly sustain commercial fishing, it is somewhat lower than the results of the winter cruise, Jan. 6 to Feb. 7, when about 30 percent of tows in this area yielded at least 500 pounds. However, these results were better than the fall cruise's, when 14 percent of tows took over 500 pounds. Catches from night tows were considerably smaller than day tows; so night fishing for shrimp with existing gear in these areas is not recommended at this time.

Two catches of over 1,000 pounds per tow were made near Stellwagen Bank (Middle Bank) in 40 to 50 fathoms. All tows in this area produced good catches; they averaged 900 pounds per tow for the 4 made. One 700-pound tow, in location that previously produced only small catches, shows that shrimp had moved into this section since the winter cruise. Otherwise, shrimp populations on Middle Bank generally appear to be about

the same now as during the winter season. However, the size of the individual shrimp was somewhat smaller than then.

The most noticeable change in shrimp populations was in Wilkinson Basin. Only one of the 27 tows produced 500 pounds or more. This compares poorly with winter survey, when 14 of 40 tows produced this quantity. The one exceptional tow, a catch of 800 pounds, came from Wildcat Knoll. In the Basin area, the size composition of catches was smaller than during the fall and winter surveys.

In the Jeffreys-Scantum Basin areas, shrimp populations were rather large and extensive. Four of the 8 tows produced 500 pounds or more. This compares well with results of winter survey and indicates little change in population and distribution of shrimp in these 2 sections. Here, as in Wilkinson Basin, shrimp size generally was smaller than during previous 2 cruises. Many small shrimp were observed escaping from forward sections and cod end of the trawl as it was hauled aboard. For the first time in any of our surveys, Pandalus montagui (a smaller species of pink shrimp), was taken in noticeable numbers from this and Middle Bank area.

### Other Species

Finfish generally were abundant in all areas fished and were easily separated from the shrimp by the Base-designed mechanical shrimp-fish separator.

For further information contact Keith A. Smith, Base Director, or Phillip S. Parker, Fishery Biologist, EF&GR Base, State Fish Pier, Gloucester, Mass., 01930, Telephone: 617-283-6554.



## La Jolla Issues Temperate Tuna Forecast for 1968

BCF's Fishery-Oceanography Center in La Jolla, Calif., has issued the eighth consecutive annual prediction for the summer season albacore and bluefin tuna fisheries off the Pacific Coast.

The 1968 forecast was made 3-4 weeks later than in previous years.

The staff of the Fishery-Oceanography Program explains the change in prediction date and outlines its forecast:



The delay in issuance of our predictions arises from experience accumulated during the past 8 years. This showed that prediction techniques once thought valid have not withstood the test of time satisfactorily. Our prediction techniques were based on the expected persistence of large-scale sea-surface temperature anomaly patterns. Consequently, the offshore thermal trends observed in April of each year were assumed to persist at least through July. Last year, this assumption failed: the abnormally cold conditions observed in April 1967 were the basis for our predicting a late, more southern, fishery than in 1966. Later, intense early-summer warming completely overtook the previous cooling trend. By July 15, abnormally warm conditions were established in the Pacific Northwest and persisted for the remainder of the season. The albacore responded rapidly to these dynamic changes, producing near-record catches off Oregon and Washington, while California experienced very poor fishing.

#### A New Approach

This experience dictates that we alter substantially our approach to the 1968 season. One major change will be the temporary suspension of long-term quantitative landings and area forecasts. A second will be to make heavier use of short-term projections of conditions based on current information issued in the form of outlooks and occasional bulletins. These bulletins, well received last year, will include: changes in oceanographic and atmospheric trends; changes in location of productive fishing areas; changes in total fishing effort; and other data pertinent to the fishing community. As before, the success of these operations depends necessarily on the input of first-hand information from the fishermen at sea, dock operators, and processors. We continue to be hampered by a scarcity of such timely information.

#### ALBACORE TUNA

The basis for depicting the shaded areas in Figure is previous knowledge of the high correlation between catch and sea temperature--combined with an 8-year experience in observing and summarizing sea-surface temperatures at 15-day intervals from April to October. The isotherm fields for the first and second halves of July represent our long-term averages for each interval. The shaded areas delineate the region where, on the basis of sea temperature averages, most albacore

would be available in July. Since prevailing weather and sea temperature patterns may deviate considerably from these averages during the period, we will modify and update our projections as conditions indicate. These projections will be forwarded to the fishing community as soon as practicable.

#### Preseason Scouting Minimal

Preseason scouting activities will be minimal this year. The usual May-June offshore scouting cruise by California's "N. B. Scofield", undergoing overhaul, was cancelled. This resulted in substantial reduction of our ability to make early-season judgments based on data she normally acquired. BCF's "David Starr Jordan" first reported taking 4 albacore near San Juan Seamount (33° N., 121° W.) on June 12. This catch is the first authenticated report available this season. It suggests the fish may be arriving on the Pacific Coast feeding grounds up to 2-3 weeks earlier than in the past 3 years.

The open ocean in the region encompassing the general migratory route of albacore (130°-150° W.) showed large-scale warming trends in late May and early June. If the warming trend continues, we expect to see an appreciable portion of the incoming migrants diverted into northern waters instead of southern California. The Guadalupe Island area and the region to the northwest may produce some early-season catches, but we expect the fishery to advance rapidly northward from San Juan Seamount to west of Davidson Seamount by the end of July.

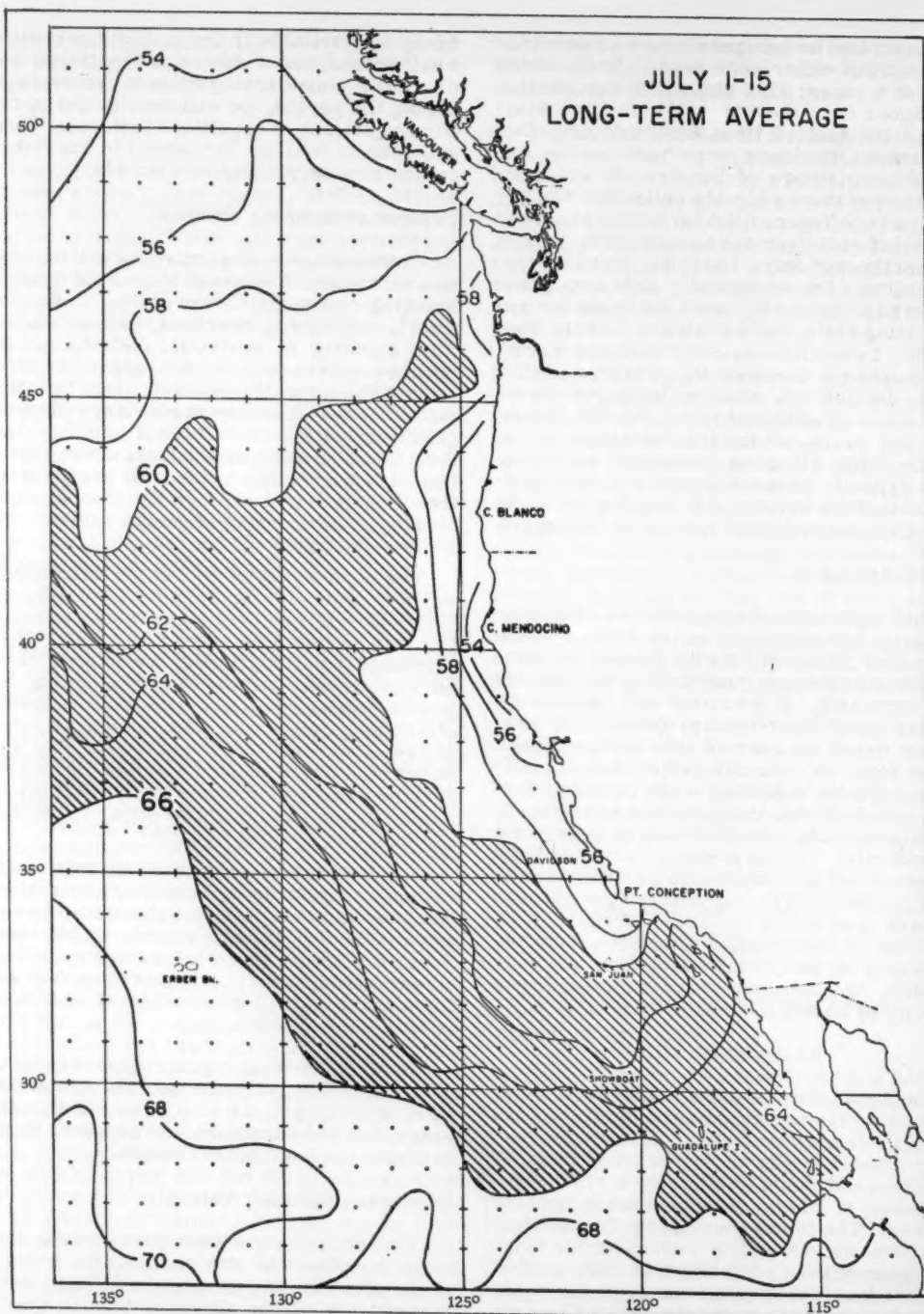
July landings in southern California should reflect a return to more normal conditions. The landings should be near the 1940-66 average of about 6,600,000 pounds (3,300 tons). Total California season landings cannot yet be estimated, but we expect they may also fall near the 1940-66 average of 30,000,000 pounds (15,000 tons).

The Oregon-Washington region is expected to receive a significant portion of the total U. S. West Coast albacore production this year. But total landings are expected to fall somewhat below 1966-67 levels.

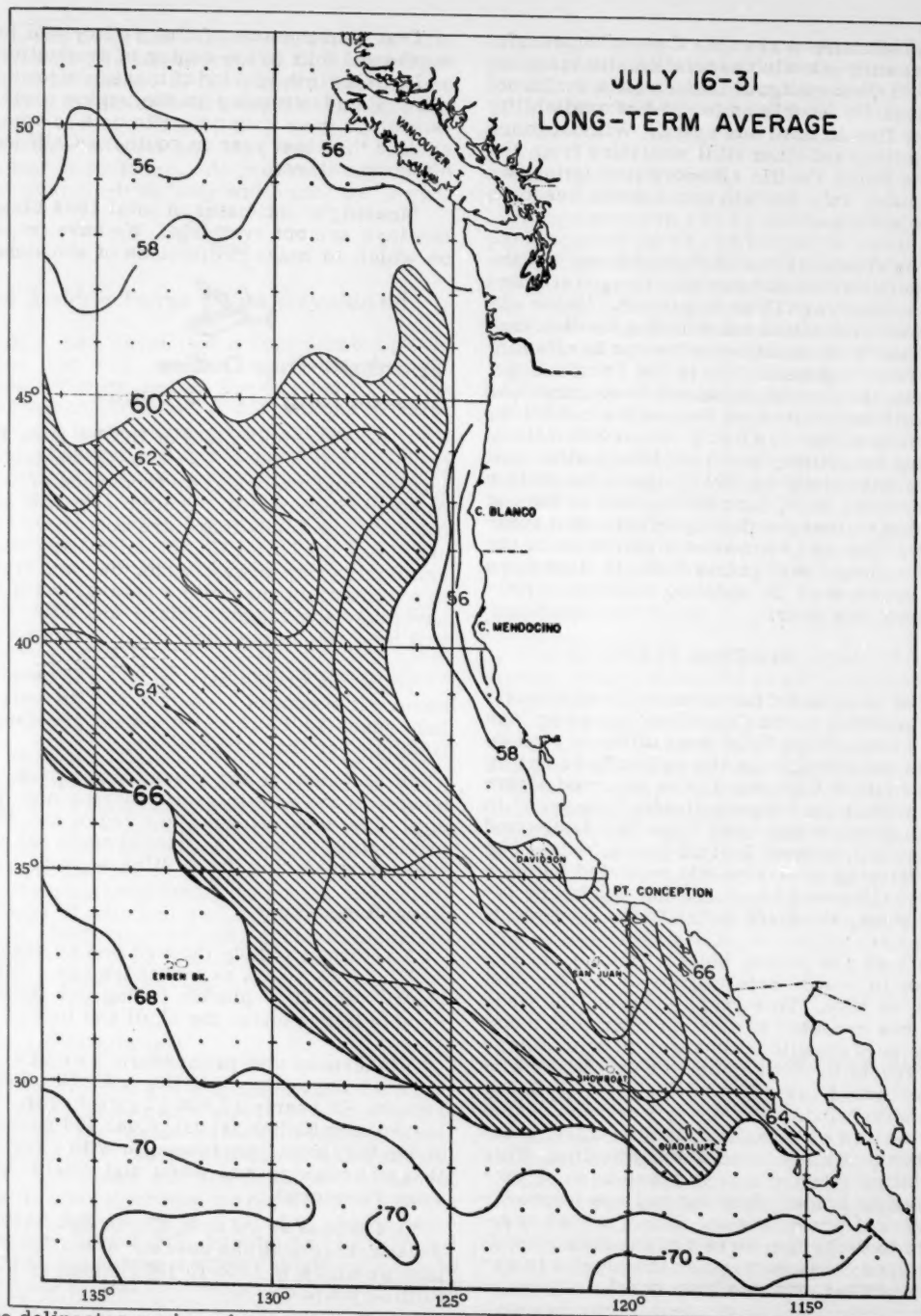
#### Preseason Scouting Valuable

The Jordan's recent early-season albacore catch continues to demonstrate the value of preseason scouting cruises to determine the arrival time of the albacore tuna in Pacific





Average sea-surface temperature fields for the July 1-15 and 16-31 intervals. Shaded



zone delineates region where most albacore would be available under these conditions.

Coast offshore waters. Even if successful forecasting of environmental conditions were possible, knowledge of these trends would not necessarily enable us to predict availability of the fish in time and space. Without more life history and other vital statistics from the entire North Pacific albacore population, we can make only certain conclusions based on other sources.

The Jordan is scheduled to survey the northern California-southern Oregon offshore region from July 15 to August 16. Major objectives will include establishing the distribution and availability of albacore in offshore waters during the middle of the Pacific coast season; also, to test prospects for commercial exploitation of albacore beyond the traditional limits of the fishery (about 300 miles). During the cruise, pertinent information will be radioed daily to WWD, the radio station licensed to BCF, for rebroadcast as part of the daily albacore fishing information summary. The information gained from the Jordan should be of prime value to fishermen and processors in updating midseason projections this year.

#### BLUEFIN TUNA

The high-seas purse-seine fleet intensified scouting in the Cape San Lazaro-Cape San Lucas, Baja California offshore region. Boats returning from the yellowfin fishing area south of Cape San Lucas reported sighting in the past 2 weeks bluefin "jumpers" in cold, green water near Cape San Lucas and northward to near Point Tosco. Also, one sportfishing boat recently reported taking a few 10-15 pound bluefin in the Guadalupe Island area, about 400 miles to the northwest.

In recent years, bluefin fishing activity began in lower Baja California by the last week of May. This year, however, the fishery was expected to develop later than usual because of significant changes in climatological events in that region. Lower Baja California has experienced a spate of strong northerly winds. The heavy weather created has severely limited fishing activity and caused greatly intensified upwelling. This upwelling created a nearshore band of considerably colder than normal sea temperatures and green water. These events combined to delay the onset of the fishery well into June; they may cause the bluefin to remain farther offshore than usual.

One consequence of the delay will be a northward shift in the center of production--and a delay in the period of maximum production. Rapid warming in the region north of Guadalupe may cause bluefin tuna to appear earlier than last year in southern California offshore waters.

Meaningful estimates of total 1968 bluefin landings are not available. We have no data on which to make projections of abundance.



#### 'Spaghetti' Tags Outline Alaskan King Crab Grounds

Since 1961, biologists of BCF's Auke Bay (Alaska) Laboratory have been capturing, tagging, and releasing thousands of male Alaskan king crabs. Their purpose is to find out how many there are and where they are distributed in the Kodiak Island and Eastern Bering Sea areas. Also, they are trying to estimate how many die a natural death and how many are caught. These and other data will help determine conservation measures.

While the crab's size makes it troublesome--it averages 7 pounds and its walking legs reach 24 inches--the real problem is finding a tag that will stay on.

In the past, a tag shaped like a disk was used to trace crab migration during one season. The disk, attached to a leg or the edge of the shell covering, would come off with these parts during the molting season.

#### Long-Range Study

To conduct a study through one or several molting seasons, researchers use a "spaghetti" tag. It is plastic tubing put through muscle tissue under the shell and looped.

Fishermen and processors receive \$2 for each tag returned to the Auke Bay Laboratory. Of nearly 17,000 tagged crabs released near Kodiak Island, 6,443 (38 percent) of the tags have been turned in with information on crab size and when and where they were recovered.

In the past 20 years, the U. S. catch of Alaskan king crab has soared--from 1.5 million pounds in 1950 to 1966's high of 159.2 million pounds.

In late 1964 and early 1965, Japan and the USSR agreed not to fish for U. S. stocks of king crab except in the eastern Bering Sea. Quotas for this area are negotiated annually. There was agreement, too, on type of gear that may be used and size and sex of crabs allowed to be taken. At present, only males with over 5½-inch body width may be kept.



## Fast-Sinking Purse Seine Developed

BCF has developed a fast-sinking purse seine that will provide tuna fishermen with more efficient gear. The new net retains the desirable features of the tuna purse seine now used in the eastern tropical Pacific--but will sink faster and use webbing with greater economy. The importance of a net sinking fast is illustrated by the fact that about 50 percent of purse-seine sets for tuna are unsuccessful because fish escape the net during setting and pursing operations.

The net was developed by BCF's Fishery-Oceanography Center in La Jolla, Calif., in cooperation with the BCF Exploratory Fishing and Gear Research Base in Seattle, Wash.

### The Conventional Purse Seine

The purse seine in use today is a large encircling net with a closable bottom. It is one of the fisherman's most effective instruments for capturing mobile, dense schools of open-sea fish. Throughout the world's oceans, fishermen use purse seines to take fish ranging from small anchovies and sprats to huge bluefin and yellowfin tuna. In the U. S. alone, in recent years, more than 1 million metric tons of fish worth over \$75 million have been caught annually with purse seines.

### About 50% Efficient

Despite the growing importance of purse seining, researchers made few attempts to improve the net's catch efficiency of about 50 percent. The proportion of unsuccessful sets increases with the depth and nature of the thermocline--the zone of water in the ocean where there is a rapid change in temperature with depth. Biologists theorized that if tuna purse seines could be made to sink faster and fish deeper, efficiency would

improve. It was estimated that only a 10 percent improvement in the rate of successful sets would reduce operating costs for the U. S. tuna fleet by more than \$1 million annually.

### Attacking the Problem

A comparative study of the design and performance of various purse-seine nets was undertaken at BCF's Fishery-Oceanography Center. Several scaled-down models were built and tested. Evaluation of the data revealed that the best net for fishing tuna should be a combination of the fast-sinking North Atlantic purse seine with the strength, deep fishing, and ease of handling of the American tuna seine. A model hybrid purse-seine net incorporating desirable design elements was built and tested. Results of the model tests were so encouraging that in spring 1968 the Center, in cooperation with the Seattle Base, undertook construction of a full-scale net, 460 by 55 fathoms, in a San Pedro net yard.

### Net Ready for Trial

The net is now ready for sea trial. Several vessel owners have offered to participate. The trials will consist of 2-3 days of routine net handling, including setting, hauling, and stacking, to determine if any special handling techniques must be devised or net modifications made. At the same time, bathymograph data on net depth and sinking rate will be collected. This will be followed by fishing trials during the summer.

If the net performs as promised, and the California purse-seine fleet accepts it, tuna fishermen will have more efficient gear.



## Antibiotics Improve Algal Food But Somewhat Toxic to Oyster Larvae

Microscopic examination of oyster larval cultures in studies conducted by BCF's Milford (Conn.) Biological Laboratory confirmed earlier evidence that poor food cultures will improve significantly when antibiotics are added. In all instances, the percentage survival of oyster larvae fed flagellates plus antibiotics was higher than oyster larvae fed flagellates without antibiotics.



### Somewhat Toxic

When algal culture is an acceptable food (larval survival is good), then antibiotics do not help appreciably. When algal culture is an unacceptable food (larval survival is poor), then antibiotics can increase larval survival significantly. These experiments also showed that the antibiotics used were toxic, to some degree, to the oyster larvae.

The researchers say it would be desirable to increase larval survival using antibiotic concentrations that did not retard larval growth. Although it would be possible to compensate for the growth-suppressing effect of antibiotics by prolonging culture time, this undoubtedly would be an undesirable hatchery procedure.



### Sea-Surface Temperature Affects Success of Net Sets

Michael Scott, fishery biologist at BCF's Fishery-Oceanography Center at La Jolla, Calif., examined over 2,000 records of purse-seine sets from logbooks of U. S. tuna fishermen. He related these sets to sea-surface temperature. He found a significant negative correlation between the temperature and the percent of successful sets. Only 47 percent of sets made on bluefin at a water temperature of 70°-76° F. were successful, while 64 percent of sets at 59°-65° F. were successful.



### Lab to Develop Feeds for Navy's Trained Porpoises

BCF's Seattle Laboratory won a small contract from the Naval Test Facility at Pt. Magu, Calif., to develop suitable feeds for the trained porpoises that are important part of the Navy's Man-in-the-Sea program.



These studies will include the nutritional value and appetite appeal of fish feeds--and the problems of feed formulation and storage.



### Turtle Grass Added to Sheep Ration Stimulates Growth

Studies by BCF's College Park (Md.) Technological Laboratory and the Biological Laboratory in St. Petersburg Beach, Fla., indicate that turtle grass added to sheep ration stimulates the animal's growth. There are large areas of turtle grass in the waters off southern U. S. Feeding trials were carried out to determine if it was practicable to use the grass in sheep rations.

#### Turtle Grass Beneficial

The trials showed that a ration of turtle grass replacing 20% alfalfa in a sheep diet produces a significant increase in rate of sheep growth--compared to the effects of a control diet of 50% alfalfa and 50% corn.

The turtle grass has flat, narrow leaves originating from a rhizome system (rootlike stem sending up leafy shoots from upper surface and emitting roots from lower side). When leaves are cut, regrowth begins immediately. This indicates material can be available all the time without harming plant. Regrowth occurs at rate of about 1 inch a week.



### Shipping Test of New Container Is Successful

BCF's Gloucester (Mass.) Technological Laboratory, which recently designed a leak-proof, corrugated fiberboard container, test-shipped 35 containers of its design in late May. It had been asked by the National Fisheries Institute for additional data under commercial conditions. The Institute supplied 250 containers.

The lab shipped by air freight the 35 boxes containing fresh fillets and wet ice from a Gloucester processor to a Chicago food chain. A representative of the box manufacturer reported that the container performed satisfactorily. He said store personnel preferred the boxes because they were cleaner and more convenient to handle than wood boxes.

#### Excellent at Arrival

The fillets were warm (50° F.) when packed. An unscheduled 24-hour delay developed in route. However, the fish cooled to 33° in transit and were reported in excellent condition when they arrived.

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## Interest on Fishery Loans Raised

Starting July 1, Government interest rates on fishery loans became  $6\frac{1}{2}$  percent. Fishery loans may be authorized to finance or refinance the cost of buying, building, equipping, maintaining, repairing, or operating commercial fishing vessels or gear--when funds are not available on reasonable terms elsewhere.



## Mortgage Insurance Rules Changed

BCF has announced changes in regulations governing interest rates on fishing vessel mortgages insured by the Department of the Interior. The new regulations are designed to make the rates charged more flexible. They should make it easier for fishermen to get these loans.

Under previous legislation, there was a 6-percent interest ceiling on such loans. In the past few months, there was a general rise in interest rates. This caused most lenders to push aside requests for fishing vessel loans in favor of others bringing a higher return.

### Law Amended

The law covering insured fishing vessel mortgages has been amended. It now permits Interior Department to determine the interest rate to charge--taking into account the risk assumed by the Department, and the private interest rates at the time of the loan.

Mortgages to finance building, rebuilding, or reconditioning fishing vessels can be insured by Interior Department in the way the Federal Housing Authority insures mortgages to finance home building.



## Promotes Lesser Known Fishery Products in Europe

Some lesser known U. S. fishery products will make their debuts at European trade fairs this fall: fresh and frozen eel meat, frozen fish chowder concentrate, haddock and cod portions shaped like hot dogs, frozen carp. BCF will sponsor exhibits at the Munich Fair, Sept. 21-29, and the Paris Fair, Oct. 24-Nov. 4.

Most of the world's major food producers and processors will display their products. Buyers from all over Europe will attend. In previous fairs, U. S. fishery displays concentrated on gourmet items--lobster, king crab, oysters. This fall some lesser-known U. S. products will be shown. Many of these are processed by small firms reaching across the ocean for the first time.

### Industry Is Invited

U. S. producers and processors are invited to display their products at both trade fairs. With BCF personnel manning the exhibits, the firms will not have to send representatives. The number of U. S. participants will be limited to available space on a "first come-first served basis."

For more information, contact Office of International Trade Promotion, Bureau of Commercial Fisheries, 1801 N. Moore Street, Arlington, Va. 22209. Telephone: Area Code 703-557-4731.



## Thai Fisheries Officer Visits Milford Lab

Tomoron Tangkulsen, a fisheries officer from Thailand, recently spent a week at BCF's Biological Laboratory at Milford, Conn. He is studying the techniques for spawning and culturing larval shellfish. Mr. Tangkulsen also observed oyster harvesting operations and the use of predator control gear in Long Island Sound.

### And Visitors From Oregon

The lab also received visits by Dr. William Breese, Oregon State University Marine Laboratory, and Dale Snow, Oregon Fish Commission. They are planning a shellfish hatchery to be built in Oregon.

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## BCF Labs Aid College Students

During the past semester, staffs of BCF laboratories across the Nation continued their practices of inviting students to visit, lectured on phases of their research, and took their visitors on cruises to observe natural phenomena or to collect specimens.

The following were representative sessions:

**At Oxford (Md.):** A class of 44 students from Hiram College in Ohio spent 3 days in concentrated field research and study. Field trips were made on BCF's research vessel "Alosa" under the direction of laboratory scientists. Staff members lectured on various aspects of marine biology to the students and their professor. Temporary classroom laboratories were set up in beach-front buildings of the laboratory.

**At La Jolla, Calif.:** Dr. Reuben Lasker, Assistant Director of BCF's Fishery-Oceanography Center, lectured to 55 oceanography students and 16 faculty members from the University of Baja California at Ensenada. He also showed the group the Center's facilities.

The students' visit to the Fishery-Oceanography Center and to the Scripps Institution of Oceanography is an annual event. It is sponsored by the Oceanids, a women's group at the University of California, San Diego.

**At Milford, Conn.:** The lab continued its cooperative program with colleges and universities in the New England area. Staff members spoke to biology classes from the University of Massachusetts and Southern Connecticut State College on research being done at the lab. Each group was taken aboard the "Shang Wheeler" to collect invertebrate specimens in Long Island Sound.

Maria Panciera and John Manzi spoke at their old Alma Mater, Southern Connecticut State College, the former on her study of quahog culture, the latter on oyster drill biology.



## Emergency Water Pump Available for New England Demonstration

BCF's Fishing Vessel Safety Unit has a new-type emergency water pump available for inspection and demonstration to fishermen along the New England coast.

This is the pump used by the Coast Guard in search and rescue operations involving commercial fishing vessels. In 1967, 38 fishing vessels from Maine, Massachusetts, and Rhode Island received the pumps--by helicopter lowering, a plane drop, or transfer from a Coast Guard surface vessel.

The Bureau is eager to show interested groups of fishermen how the unit is operated in pre-emergency sessions.

For further details, write to BCF Safety Unit, 408 Atlantic Ave., Boston, Mass., 02210, or phone 617-223-7748.



## Marketing Services Chief Wins Golden Chef Award

Bob Finley, Chief, National Marketing Services Office, BCF, Chicago, won the Golden Chef Award from the Executive Chef's Association. The award was given to him for significant contributions to the culinary arts by promoting the increased use of fish and shellfish.

Finley has been asked to accompany the American Culinary Olympic team to Frankfurt, Germany, for the international competition. He helped judge this year's U. S. competition. The team will demonstrate and feature American seafoods on the continent in a gourmet manner.



# ARTICLES

## VACUUM EVISCERATION

### A Modern Method of Cleaning Fish at Sea

By Thomas J. Connors\* and Daniel W. Baker\*\*

Modern methods of handling fish are largely absent from the fishing vessels. In New England off-shore fishing, laborious traditional methods of handling fish on board may have been adequate in the past, but under modern standards of efficiency, product quality, and sanitation, greatly improved methods of handling are needed.

One operation in the fish-handling system that requires improvement is the evisceration of fish. The current practice necessitates teams of 3 men--usually, one ripper and two gutters per team. The work is generally done on the deck, which does not always present a clean, safe, work area because fish and offal accumulate underfoot. This inefficient operation is the major factor in determining crew size.

The Bureau of Commercial Fisheries Technological Laboratory at Gloucester, Massachusetts, has developed, as part of an overall automated handling system, a prototype vacuum eviscerator. This paper compares the new with the present system and outlines the advantages of the new system.

#### THE PRESENT METHOD

The evisceration of fish on board a large off-shore trawler usually requires two 3-man teams, each team composed of a ripper and 2 gutters. The fish taken in a trawl are dumped on deck. The net is put over for the next tow. Then the rippers stand among the fish, in a tiring bent-over position, select fish, and rip open the visceral cavity with a knife. They then toss the fish to the deck outside the checker, where the gutters remove the viscera by hand, throw the fish into a wash box, and drop the offal to the deck. Here the boat's motion and the wet deck result in mixing ripped fish with viscera. Efficiency, cleanliness, and safety are sacrificed under these tiring and dangerous conditions.

The efficiency of this method was measured from films taken onboard a commercial trawler during normal fishing operations. Under normal working conditions, about 16 fish (weighing an average of 2.5 lbs.) can be ripped, gutted, and washed in 1 minute. Hence:

$$\frac{16 \text{ fish/min.} \times 60 \text{ min./hr.} \times 2.5 \text{ lbs./fish} = 400 \text{ lbs./hr./man}}{2 \times 3 \text{ men}}$$

#### VACUUM EVISCERATION

To determine the productivity of the vacuum eviscerator, we made a time study at the Gloucester Laboratory. Figure 1 shows a diagram of a single mechanically operated vacuum pump and tank. Since a number of such stations can be operated from a single pump and tank, the number of stations would be limited primarily by the size of the vessel and crew. This equipment offers flexibility by permitting the combination vacuum tank-trap to be located anywhere on the vessel, so it does not interfere with normal fishing operations. The vacuum evisceration device then can be connected to the central suction head by a flexible hose allowing the catch to be processed where dumped; it eliminates unnecessary handling. This equipment can be adapted to operate with any reserve power a vessel may have.

Figure 2 shows the sequence of operation of the valve linkages. After the operator pushes a fish onto the interchangeable nozzle, shown in Figure 1, he depresses the foot pedal to open the vacuum valve (b), and the vacuum pulls out the viscera, which it then deposits in the vacuum tank-trap. By further depressing the foot pedal, the operator closes the vacuum valve and simultaneously opens the water-flushing valve (c). When water overflows the visceral cavity, he releases the foot pedal part way to position B, closing the flushing valve and opening the vacuum valve, instantaneously removing the flush water.

\*Research Chemist

\*\*Mechanical Engineering Technician

BCF Technological Laboratory, Gloucester, Mass. 01930.

U. S. DEPARTMENT OF THE INTERIOR  
Fish and Wildlife Service  
Sep. No. 819

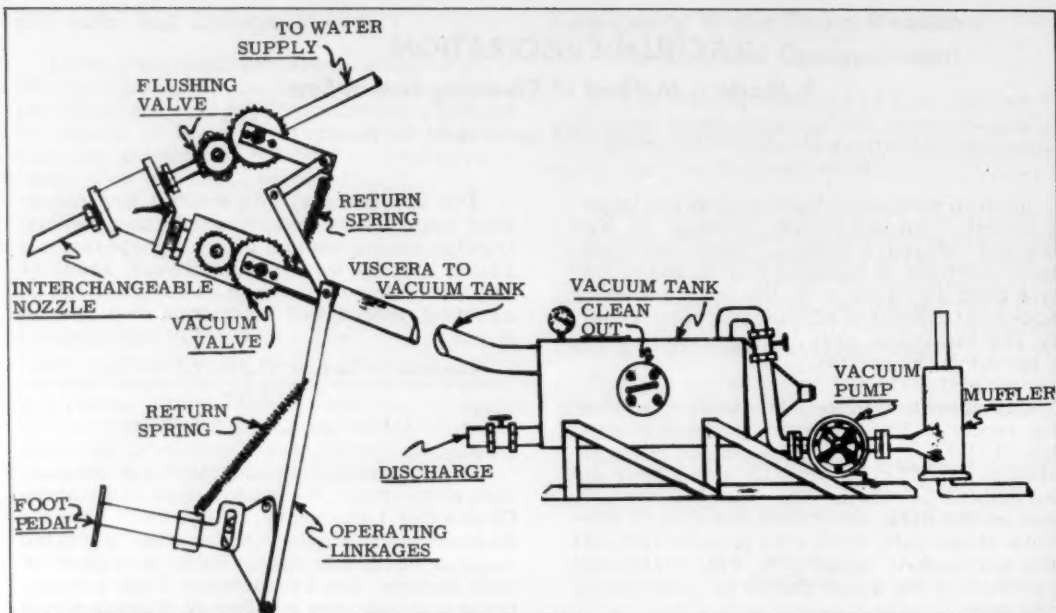
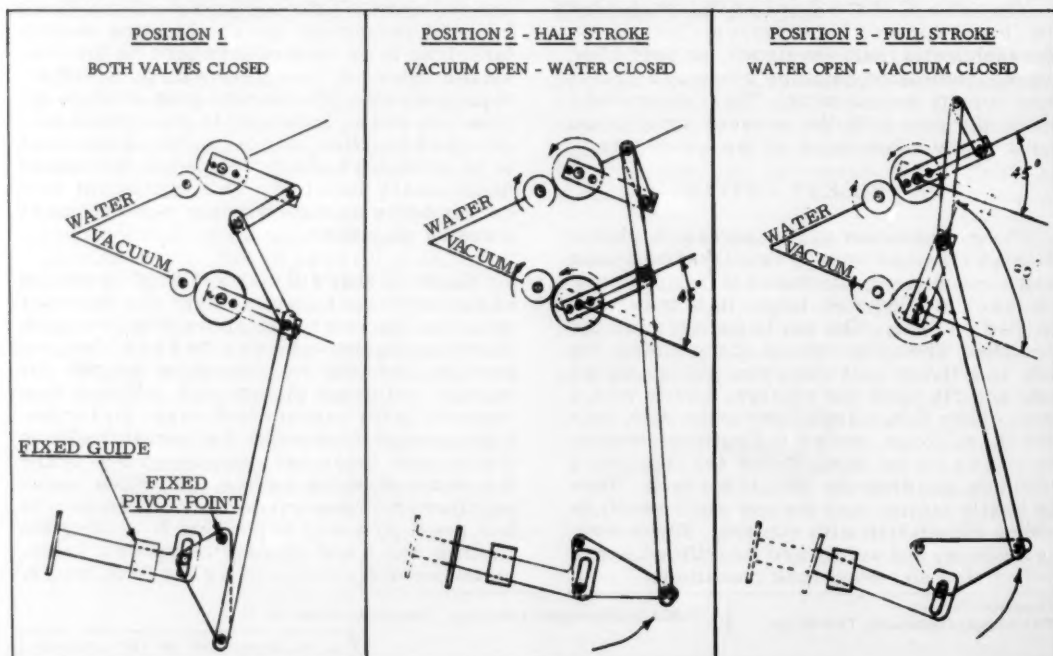


Fig. 1 - Semi-automatic prototype vacuum eviscerator and flushing device for cleaning the visceral cavity of fish.



Valve operation is sequential through operating linkage. Valves are gear operated through ratio of 2 to 1.  $45^\circ$  rotation of large gear rotates small gear  $90^\circ$  for full opening of ball valve.

Fig. 2 - Schematic of linkage for valve operation of vacuum eviscerator.

When he completely releases the foot pedal, he closes the whole system, as in (A), leaving it ready for the next sequence.

At a more advanced stage of development, the entire sequence can be made completely automatic and adapted to the special needs of individual vessels.

In measuring the performance of vacuum evisceration, we found that a fish could be cleaned and flushed in about 10 seconds during continuous operation. Thus, one man can eviscerate and flush:

1 fish/10 sec. X 3, 600 sec./hr. X 2.5 lbs./fish = 900 lbs./hr./man

#### ADVANTAGES OF VACUUM EVISCERATION

Vacuum evisceration and flushing provide these advantages:

1. The crew size of larger vessels can be reduced by 3 men, resulting in more income per man. Also, this mechanization releases to other vessels experienced men, who are in short supply.

2. The equipment can be placed in such a manner that the men can work in a convenient

sitting or standing position, instead of a tiring, bent-over, position.

3. Safer working conditions can be provided because no fish or offal would be deposited on deck causing dangerous, slippery footing.

4. Bacterial contamination can be reduced because the fish do not have to be cut. Also important, the visceral contents are effectively removed from the processing area. The quality of fish landed in port should therefore be improved.

5. The landing of higher quality fish can result in economic advantages, which benefit both industry and consumer.

#### NOTE ON INSTALLATION AND OPERATION

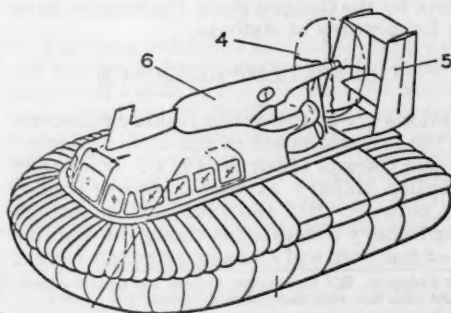
Because of our limited knowledge of the costs of equipment, fabrication, and services, we can only estimate the cost of the vacuum eviscerator. We believe it would be in the order of \$5,000. Although the prototype was tested at sea, it has not been used for any extended period. We therefore cannot estimate down times and maintenance costs, but present indications are that these units will be relatively trouble free.



#### INFLATABLE SKIRTS FOR HOVERCRAFT

An inflatable skirt that allows hovercraft a large area of supporting air cushion when they operate, but needs only a small storage area, has been patented in England.

The invention provides a skirt, held up by inflatable members, that extends laterally from the rigid base of the craft's body and increases the area of the trapped air cushion on which it hovers. With the retractable skirt, hovercraft can be designed with rigid bases small enough to be carried as lifeboats on the deck of larger vessels and yet have air cushions large enough for efficient riding when they operate. (Reprinted with permission from "Science News," weekly summary of current science, copyrighted 1966 by Science Service, Inc.)





## SCALLOP EXPLORATIONS OFF OREGON

By Lael L. Ronholt\* and Charles R. Hitz\*

BCF's exploratory fishing vessel "John N. Cobb" conducted two surveys for the weathervane scallop (*Patinopecten caurinus*) off Oregon, one in 1963, the other in 1967. The primary fishing gear was an 8-foot, New Bedford-type, scallop dredge.

In 1963, greatest concentrations of scallops occurred between Tillamook Head and Cape Falcon, Oregon, in 53 fathoms. Catch rates reached 753 scallops (5 bushels) per  $\frac{1}{2}$ -hour tow. But, when this area was fished again in 1967, catch rates reached only 10 scallops per  $\frac{1}{2}$ -hour tow. The best catch in 1967 was 118 scallops per  $\frac{1}{2}$ -hour haul off Sand Lake, Oregon, in 55 fathoms.

The first survey began Sept. 30, 1963, and lasted 7 weeks. It explored the grounds from Cape Arago to Heceta Head, from Alsea Bay to Yaquina Head, and from Cape Falcon to the Columbia River at depths from 28 to 65 fathoms (fig. 1).

The second survey, a 3-week cruise, started March 6, 1967. Hauls that had been made off Tillamook Head in 1963 were duplicated, and hauls were made over unsurveyed grounds between Cape Falcon and Cascade Head and just north of the Columbia River (fig. 1).

The primary aim of the explorations was to locate and delineate concentrations of scallops along the Oregon coast. Secondary aims were to (1) obtain information on the catch rates of the 8-foot, New Bedford-type, scallop dredge--and to compare its catching efficiency with that of a modified 400-mesh eastern otter trawl; (2) collect biological data on size, distribution, and abundance of scallops; and (3) collect scallops for meat-yield analysis by the Oregon State University Seafoods Laboratory at Astoria.

### THE SCALLOP RESOURCE

Scallops are an important fishery resource along the Atlantic coast of the U. S. (Posgay, 1957) and Canada (Bourne, 1964). A moderate scallop fishery existed in Puget Sound, Wash., between 1935 and 1952. No sustained scallop fishery exists today along the Pacific coast of the U. S. and Canada, although recent

catches off Kodiak, Alaska, indicate a fishery may develop there in the near future. Because there has been considerable speculation on the availability of scallops, surveys

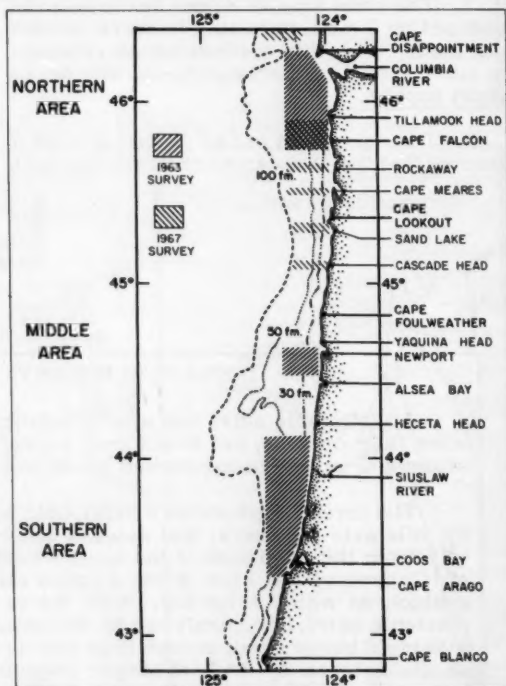


Fig. 1 - The areas surveyed for scallops off Oregon coast.

\*Fishery Biologists, BCF Exploratory Fishing and Gear Research Base, Seattle, Wash. (Mr. Ronholt now with BCF Exploratory Fishing and Gear Research Base, Juneau, Alaska.)



analysis, these areas are called: the Southern area, Cape Arago to Heceta Head; the Middle area, Alsea Bay to Yaquina Head; and the Northern area, Cape Falcon to the Columbia River. The results of the hauls can best be presented in the following three divisions: (1) availability of scallops and associated fauna to the scallop dredge, (2) size and meat yields of scallops, and (3) relative catching efficiency tests.

#### Availability to Dredge

Of the 124 scallop dredge hauls, 72 were made in the Southern area; 8 in the Middle area; and 44 in the Northern area. With the exception of three hauls on the Siuslaw River bed, all dredge hauls in the Southern and Middle areas were made at a scope ratio (length of towing cable to water depth) of 4 to 1. Speed over the bottom ranged from 1.4 to 4.0 knots and averaged 2.9. All hauls in the Northern area, and three on the Siuslaw River bed, were made at a scope ratio of 3 to 1. The speed over the bottom ranged from 1.8 to 4.6 knots and averaged 3.5.

#### Southern Area

Of the 72 hauls (fig. 3) between 30 and 60 fathoms, 39 took scallops. The largest catch rates occurred along the 40- and 55-fathom depth contours, where the average catch was 14 and 57 scallops per one-half hour, respectively (table 1). The average catch along the 55-fathom contour for the entire area is probably overestimated because 10 of the 16 hauls were replicate hauls made off the Siuslaw River. There, the greatest availability occurred on a well-defined bed (fig. 3). Most scallops were taken on this bed--up to 175 per  $\frac{1}{2}$ -hour haul.

Midpoint of Depth Intervals	$\frac{1}{2}$ -Hour Hauls	Average Per $\frac{1}{2}$ -Hour Haul				
Fathoms	No. 1/	Scallops	Crab	Starfish	Sea Pens	Fish
30	7	0.1	25.1	6.4	-	2.0
35	7	2.2	38.8	3.0	-	2.7
40	11	13.7	9.3	3.9	-	5.2
45	7	9.8	2.3	3.4	-	1.6
50	9	6.8	0.5	0.2	-	0.1
2/55	16	56.7	2.2	1.1	0.7	0.9
60	9	9.0	0.1	0.4	8.4	1.6

1/Six perpendicular hauls, Nos. 9, 17, 25, 33, 41, and 42 (fig. 3), made across the depth contours were excluded from this table.

2/Data for this interval include 10 replicate dredge hauls made off Siuslaw River on highly productive beds.

In the 72 hauls, 1,325 pounds of fish and shellfish were captured. Of this weight, scallops were 37 percent, Dungeness crab (*Cancer magister*) 25 percent, fish 12 percent, starfish 13 percent, sea pens 7 percent, egg cases of big skate (*Raja binoculata*) 5 percent, and miscellaneous invertebrates 1 percent. Dungeness crabs were found primarily in the shallower depths (30 and 35 fathoms, table 1) from Coos Bay to Siuslaw River. Starfish and fish catches were common but small at all depth intervals. The sea pens occurred only in the deep-water intervals. Skate egg cases were found primarily in three hauls, Nos. 49, 50, and 51, made just off the Siuslaw River mouth--and the numbers taken were 61, 19, and 38, respectively.

#### Middle Area

The catches of eight hauls consisted primarily of starfish and miscellaneous fish in amounts of less than 25 pounds per  $\frac{1}{2}$ -hour haul. No scallops or crabs were taken.

#### Northern Area

Scallops were found in 34 of the 44 hauls and were distributed primarily between 40 and 65 fathoms (fig. 4). Catches were larger here than in the other two areas surveyed. The catch rates were best at the 50- and 55-fathom depth contours, where they averaged 289 and 316 scallops per  $\frac{1}{2}$ -hour haul (table 2). The largest catches occurred in three hauls between Tillamook Head and Cape Falcon near the 50-fathom depth contour. The haul numbers were 107, 112, and 116, and their respective catches were 635, 619, and 753 scallops per  $\frac{1}{2}$ -hour haul.

Table 2 - Number of  $\frac{1}{2}$ -Hour Hauls and Average Catch Rates of Fish and Shellfish Taken in Northern Area

Midpoint of Depth Intervals	$\frac{1}{2}$ -Hour Hauls	Average Per $\frac{1}{2}$ -Hour Haul				
Fathoms		Scallops	Crabs	Starfish	Sea Pens	Fish
30	1	-	44.0	3.0	-	1.6
35	6	0.2	16.7	6.5	-	1.6
40	7	16.4	24.1	2.1	-	0.6
45	8	98.1	124.5	2.6	-	0.4
50	8	289.0	14.6	3.6	-	0.6
55	7	316.3	0.6	8.0	-	2.6
60	5	38.6	0.2	3.4	1.2	0.8
65	2	5.5	-	-	1.0	1.0

In the 44 hauls, 3,692 pounds of fish and shellfish was taken. Of this weight, scallops made up 50 percent; Dungeness crab, 41 percent; fish, 1 percent; starfish, 6 percent; and egg cases of big skate, 2 percent. Dungeness

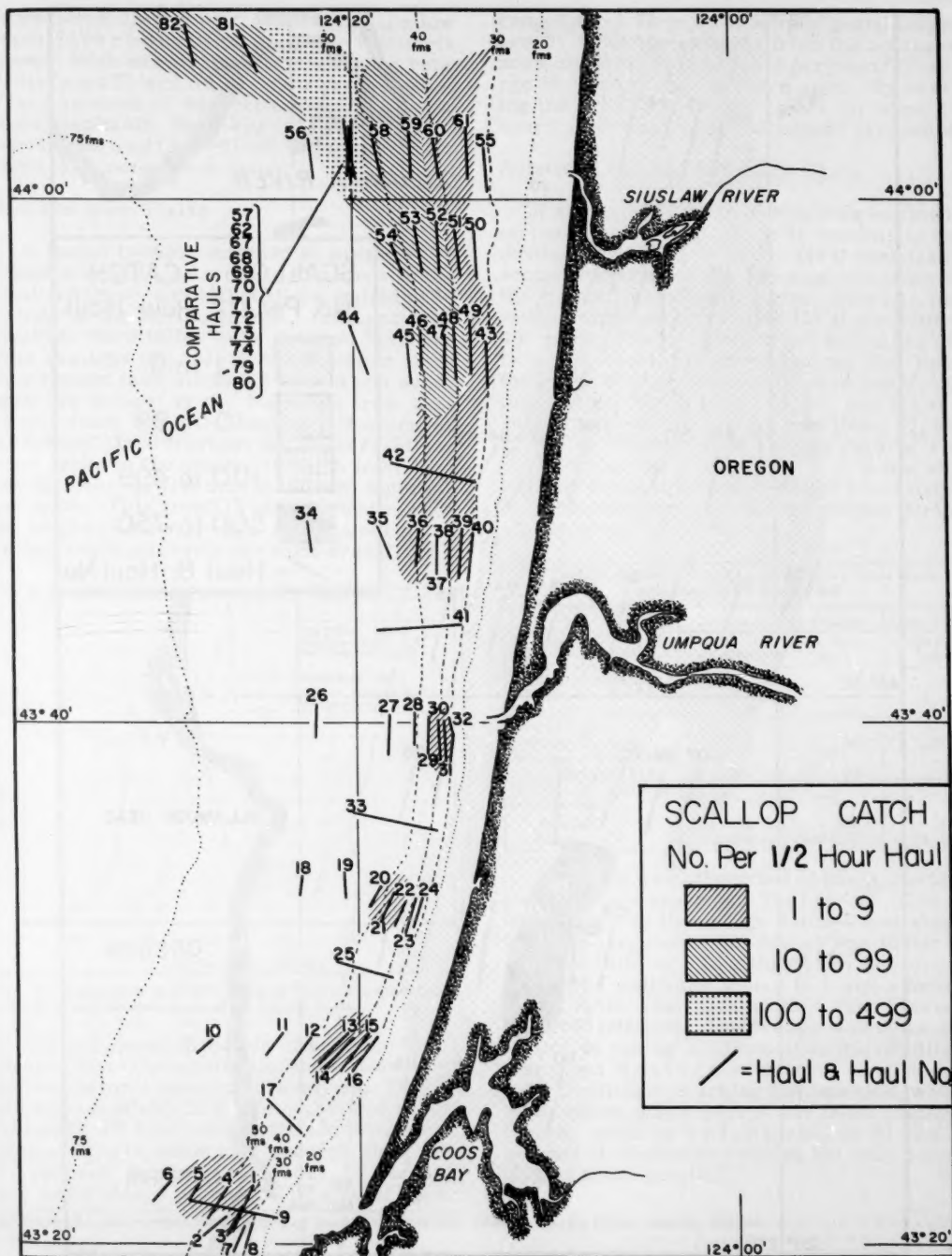
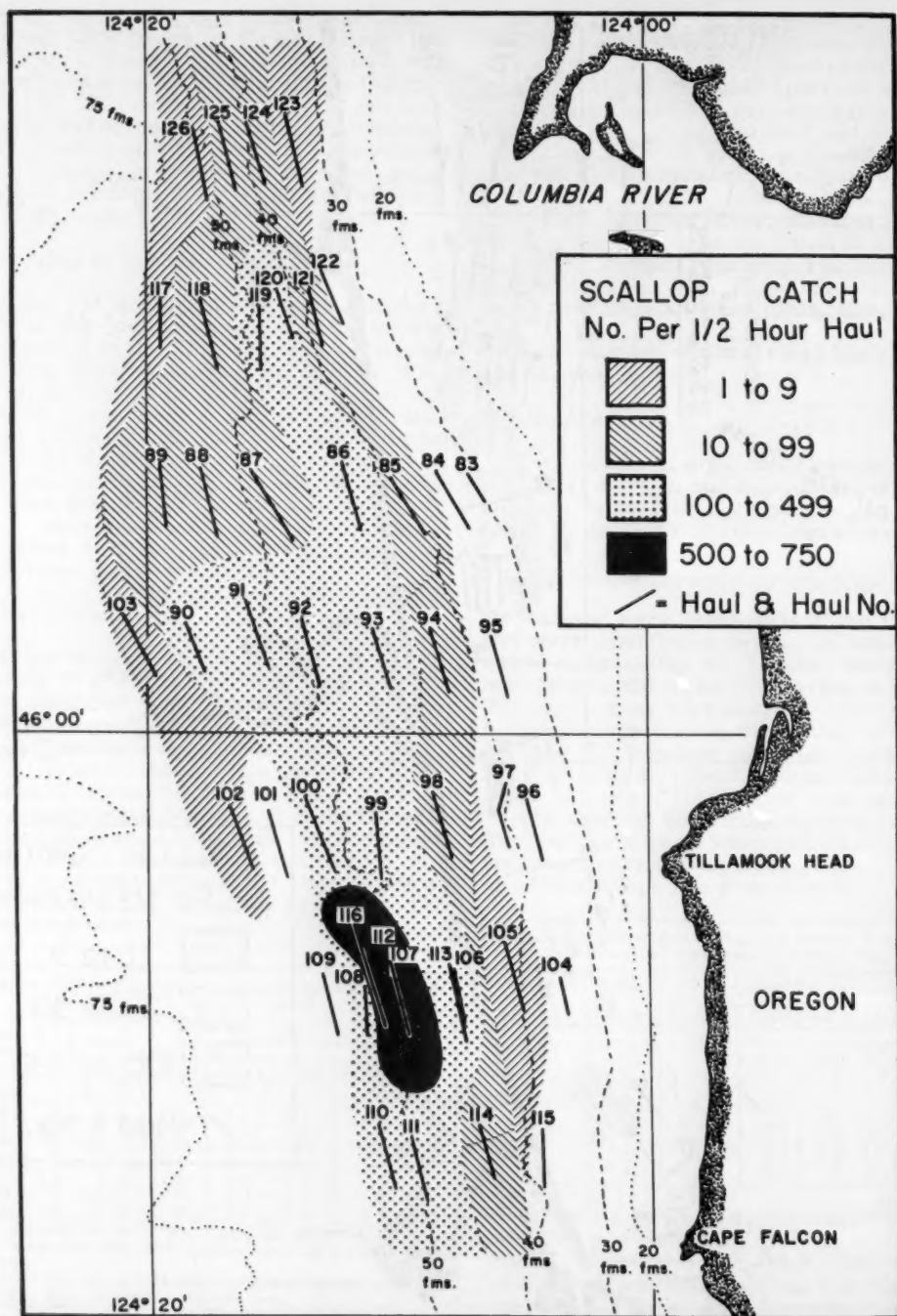


Fig. 3 - Distribution and relative abundance of scallop and location of scallop dredge stations in Southern area.







crabs were found primarily in the shallow depth intervals (table 2) off the Columbia River. Fish and starfish catches were relatively small and occurred at all depths. Trace amounts of sea pens were taken in some deep hauls. Skate egg cases were dominant in one haul (No. 96) off Tillamook Head; there, 150 cases were taken.

#### Size and Meat Yields

A bushel basket contained an average 117 scallops weighing an average 45 pounds in the Southern area--and 150 scallops weighing 50 pounds in the Northern area. Southern area scallops were taller in height than Northern area scallops (fig. 5). In the Southern area, they ranged from 3.3 to 6.3 inches and averaged 4.6 inches; in the Northern area, they ranged from 3.1 to 5.1 inches and averaged 4.2 inches. In both areas, the largest scallops were taken in the shallower depth intervals, and the average size decreased with increasing depth. This trend is clearly shown when the height-frequency data are plotted by 5-fathom depth intervals for each area (fig. 6).

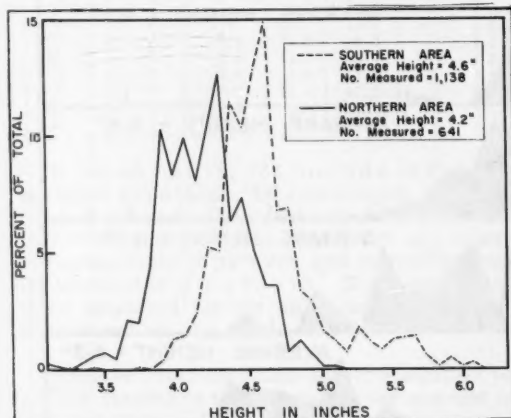


Fig. 5 - Comparison of height frequency of scallops taken in Northern and Southern areas of the Oregon coast.

We delivered 798 pounds of scallops to the Oregon State University Seafoods Laboratory in Astoria for a meat-yield analysis. The results are available in a mimeographed report by Law<sup>2</sup>. Of total weight, the adductor muscles, or meats, made up 7 percent; the shell, 57 percent; the remaining body, 33 percent; and water loss, 3 percent. The size of meats

ranged from 28 to 34 count per pound (average 31.3) in the samples from the Southern area, and from 51 to 58 count per pound (average 53.5) from the Northern area. By soaking the meats in fresh water for about 12 hours, their total weight increased 14 percent.

#### Relative Catching Efficiency Tests

A series of 12 comparative tows was made on the Siuslaw River bed in 55 fathoms in the Southern area to determine: (1) if changes in scope ratio affected the catching efficiency of the 8-foot, New Bedford-type, dredge for weathervane scallops; and (2) if a modified 400-mesh Eastern otter trawl was more efficient at catching scallops than the New Bedford-type dredge. Ten hauls were made with the dredge, three (Nos. 69, 70, and 71) at a scope ratio of 3 to 1 and seven (Nos. 57, 62, 67, 68, 72, 73, and 74) at a scope ratio of 4 to 1. Two hauls (Nos. 79 and 80) were made with the otter trawl at a scope ratio of 3 to 1 (table 3). The average speed over the bottom during all hauls was about 3 knots.

Table 3 - Catches Taken in Comparative Hauls Made on Siuslaw River Scallop Bed

Item	8-Foot Scallop Dredge		Otter Trawl
	Scope Ratio, 4:1	Scope Ratio, 3:1	Scope Ratio, 3:1
Number of hauls	7	3	2
Average speed over the bottom (knots)	2.8	2.9	3.0
Average catch of all species (pounds)	21	36	397
Average occurrence of scallops in catch (%)	91	89	5
Number of scallops per 1-hour haul:			
Average	60	163	33
Range	5-135	145-175	23-43

Despite the small number of hauls, certain relations are apparent. The average number of scallops in the dredge catches was about twice as large when the dredge was fished at a scope ratio of 3 to 1 than when fished at 4 to 1; this indicates that 3 to 1 was a better scope ratio when fishing this gear between 30 and 60 fathoms. The dredge was more efficient at taking scallops than the modified 400-mesh Eastern otter trawl--but it was very inefficient in taking fish species, which made up the major part of the trawl catches. Scallop catch by weight made up 91 and 89 percent of the dredge catches, but only 5 percent of trawl catches.

<sup>2</sup>Duncan K. Law, Oregon State University Seafoods Laboratory, 1236 W. Marine Drive, Astoria, Oregon.

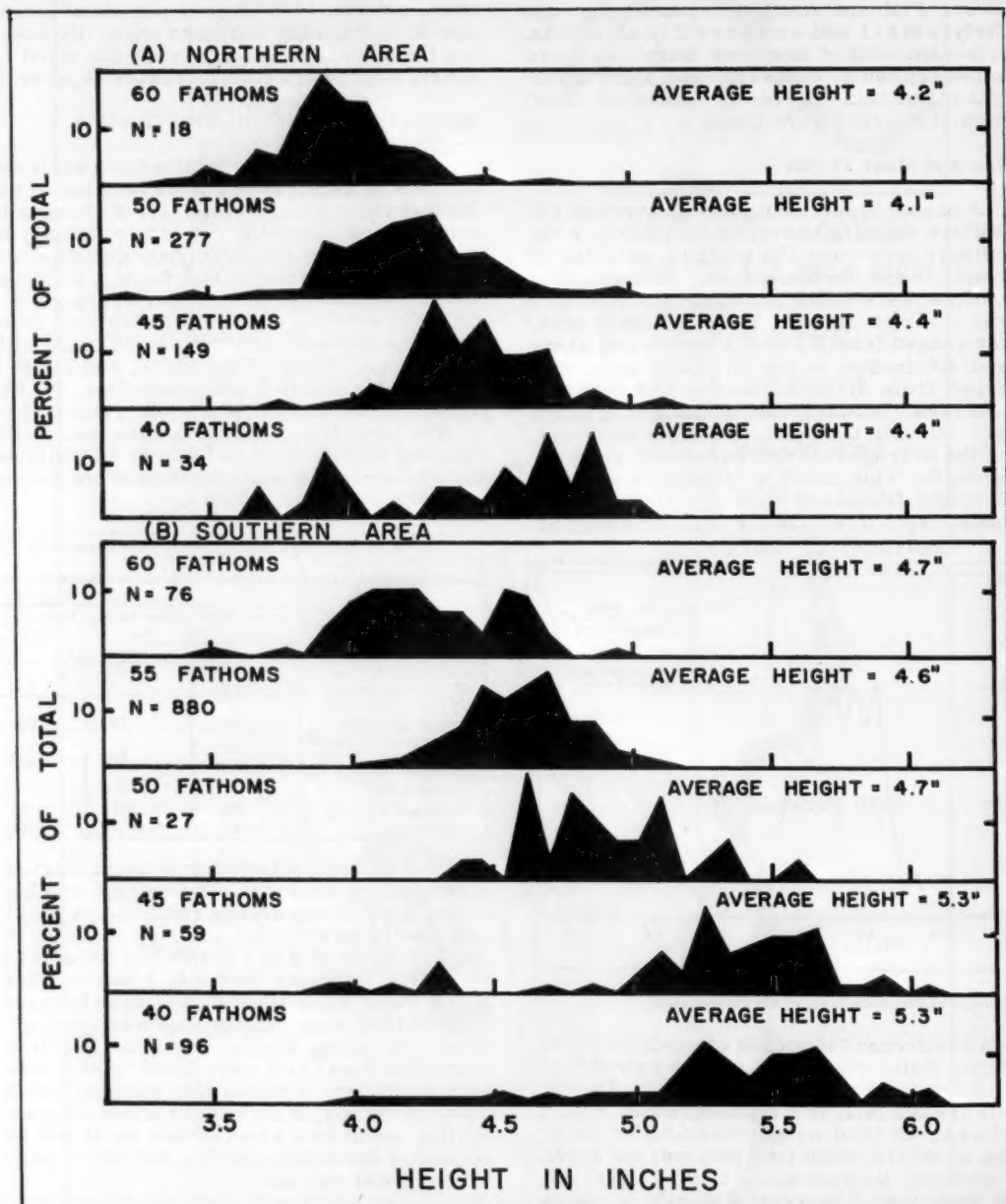


Fig. 6 - Comparison of height frequency by depth for scallops taken in (A) Northern area and (B) Southern area.

## RESULTS OF 1967 SURVEY

During the 1967 survey, 48 scallop dredge hauls were made. Between Tillamook Head and Cape Falcon, Oregon, 13 hauls were made at 1963 survey stations (fig. 1). Of the remaining hauls, 7 were off Rockaway, 6 off Cape Meares, 6 off Sand Lake, 4 off Cascade Head, and 10 just north of Columbia River. All hauls were  $\frac{1}{2}$ -hour long. They were made at a scope ratio of 3 to 1, and speed over bottom ranged from 2.2 to 5.4 knots and averaged 3.9 knots.

Of the total hauls, 24 contained scallops. The largest catches occurred along the 55- and 60-fathom contour (table 4). The largest catch, 118 scallops, was taken off Sand Lake in 55 fathoms.

Table 4 - Number of  $\frac{1}{2}$ -Hour Hauls and Average Catch Rates of Fish and Shellfish Taken in 1967 Survey

Midpoint of Depth Intervals	$\frac{1}{2}$ -Hour Hauls	Average Per $\frac{1}{2}$ -Hour Haul				
		Scallops	Crabs	Starfish	Sea Pens	Fish
Fathoms		(Number)				(Pounds)
25	2	-	2.0	4.0	-	5.0
30	1	-	6.0	79.0	-	1.6
35	7	-	68.7	15.6	-	4.2
40	7	1.6	10.0	14.0	-	2.9
45	7	3.1	11.1	28.1	-	2.4
50	7	6.3	2.4	11.3	.1	1.8
55	8	17.3	14.4	42.8	.1	2.8
60	7	10.4	4.4	11.4	.5	2.5
65	2	1.5	2.0	12.5	.3	2.1

In the 48 hauls, 982 pounds of fish and shellfish were taken. Of this weight, scallops were 7 percent, Dungeness crab 44 percent, fish 13 percent, starfish 17 percent, egg cases of the big skate 16 percent, and miscellaneous invertebrates 3 percent. Skate egg cases were abundant on the same bed in 1967 and 1963 (Haul 96, fig. 4).

The 1967 catches (table 4) were similar to 1963's (tables 1 and 2) except for amount of

scallops and starfish taken. The fish were found in all depth intervals, whereas sea pens were found only in deeper waters. Most crabs were found in greatest abundance in the shallower depths of less than 50 fathoms. The starfish were found at all depth intervals in both years; a higher catch rate occurred in 1967 samples. On the other hand, the scallops were found primarily between 40 and 65 fathoms; the greatest abundance occurred in about 55 fathoms.

Table 5 - Number of Scallops and Empty Scallop Half Shells Taken in Duplicated Hauls Between Tillamook Head and Cape Falcon

1963 Haul	Depth of Bottom	Number Per $\frac{1}{2}$ -Hour Haul			
		Live Scallops		Scallop Half Shells	
		1963	1967	1963	1967
Number	Fathoms				
104	35	0	0	0	0
105	40	3	10	0	0
1/113	45	122	0	30	22
107	50	635	0	40	38
112	50	619	2/	50	2/
116	53	753	0	33	142
108	55	312	0	30	36
109	60	0	0	0	44
115	40	0	0	0	0
114	45	12	7	0	6
111	50	292	3	50	76
110	55	426	0	50	76

1/Haul 113 was a repeat of haul 106, which was unsuccessful because dredge fished upsidedown.

2/In 1963, two hauls, 107 and 112, were made at same place, but only one haul was made here in 1967.

In 1963, the catch rate of scallops was high in the drags between Tillamook Head and Cape Falcon, especially in haul Nos. 107, 112, and 116 (fig. 4). All these hauls were duplicated in 1967, and the best catch was only 10 scallops (table 5). The dredge apparently was fishing in the same manner as in 1963 because empty scallop shells were taken in about the same quantity. The one exception was haul No. 116, where there was an increase of over 100 half shells.

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# INTERNATIONAL

## Some Major Fishing Industries Are in Trouble

The tide is turning for several of the world's major fishing nations--including Norway, the United Kingdom, Iceland, and Canada, where fishing is both important to the economy and an honored tradition. Their fisheries expanded appreciably during the past few years. Today, these nations are dusting off subsidy programs to buoy their industries.

Here is an outline of the situation:

- **NORWAY**, Europe's leading fishing nation and 5th in the world, was hit hard in 1967: prices fell drastically; the stockfish market was virtually lost, so too was the fresh-fish market in the United Kingdom; the boatbuilding boom ended; she suffered losses from currency devaluation by her major customers. And 1968 began with the awful collapse of the winter herring fishery.

Norway was forced to give US\$850,000 to cover losses from devaluation. She is extending an interest-free US\$4 million loan to cover inventories of stockfish exporters. She has offered to provide 7,000 tons of stockfish to the UN's Food and Agriculture Organization for the World Food Program. She probably will increase exvessel prices by larger subsidies.

- **UNITED KINGDOM** is completely reversing its fishery policy. This had been in line with recommendations of the Organization for Economic Cooperation and Development designed to end operating subsidies. Now the UK is increasing aid to parts of the industry. Government and industry leaders are discussing a minimum price scheme. Market sharing with the European Free Trade Association (EFTA) is being investigated.

- **ICELAND's** industry suffers from inefficiency and over capacity. Landings have fallen. She has lost a valuable stockfish market. The Government is providing US\$5.1 in new subsidy funds to aid the industry.

- **CANADA** is adopting floor price supports for several Atlantic coast species. The

support would guarantee a minimum price to fishermen in 1968 for cod, ocean perch, or flounder.

- **GREENLAND's** industry is enveloped by a net of adversity.

- **SWEDEN's** fishermen have seen their earnings fall 30 percent in 2 years.

- **FRANCE**, hit by fishermen's strikes, has moved to establish minimum import prices for several fish species.

- **WEST GERMANY's** fishing industry is suffering from financial deterioration. The coastal provinces have asked for Government help.



## Increase in 1968 Yellowfin Tuna Quota Adopted

Member countries of the Inter-American Tropical Tuna Commission (IATTC) voted unanimously to increase the 1968 catch quota for yellowfin tuna in the eastern tropical Pacific Ocean by 13,000 short tons. The new quota is 106,000 short tons. The increase was based on catch data and observations of fishermen and scientists indicating a yellowfin tuna abundance higher than previously indicated.

Vote by Mail

The vote to increase the quota was taken by correspondence among IATTC member governments--Canada, Costa Rica, Ecuador, Mexico, Panama, and the U. S. Concurrence was announced May 21 by IATTC's Director of Investigations.

Fishery Is Closed

The fishery was closed on June 18. After that date, U. S. tuna seiners would be allowed an incidental take of yellowfin up to 14 percent. Bait boats could take an incidental catch of 40 percent until they reached 1,500 tons.



## 50 Asian Vessels Fish for Atlantic Tuna

About 20 Japanese and 30 Formosan and South Korean tuna long-liners were fishing for albacore tuna in the eastern Atlantic Ocean off Angola in early May. Fishing was reported good. The vessels were catching around 3 metric tons and as much as 5 tons per set. However, because the albacore were small (29-31 pounds), the export price dropped sharply to around \$445 a short ton c.i.f. Puerto Rico. Large albacore taken in the Atlantic were bringing around \$475 a short ton c.i.f. Puerto Rico.

### Summer Season

As the summer season approaches, albacore fishing begins to pick up in the more northerly regions of the Atlantic, off the Azores and Bermuda Islands, and in the West Indies off Saint Martin Island. Good fishing in those regions could further depress the albacore export price.

### In Gulf of Guinea

Yellowfin fishing in the Gulf of Guinea, where good catches had been made, was reported declining in early May. The fishery in the central equatorial Atlantic also was tapering off. ("Suisan Tsushin," May 8, 1968.)



### WHAT IS THE SOURCE OF THE GULF STREAM?

The Gulf Stream received its name because of the misconception that its source was the Gulf of Mexico. It is now known that water of the Gulf contributes very little to the flow of the Gulf Stream.

Two currents, the North and the South Equatorial Currents, join to flow through the passages between the Windward Islands into the Caribbean Sea. The resultant current, flowing through the Yucatan Channel, has only one outlet between Florida and Cuba. Off the southern coast of Florida, other currents coming from the northern coast of Puerto Rico and eastward from the Bahamas add to the flow of the Gulf Stream. ("Questions About The Oceans," U. S. Naval Oceanographic Office.)

## Sweden Aids India's Fisheries

The Swedish International Development Authority (SIDA) will present 2 trawlers to India as gifts late this summer after shake-down and crew training. The 2--"Blue Fin" and "Red Snapper"--were launched at Solvesborg in southern Sweden on April 25, 1968.

Both trawlers are the Norwegian Norske Veritas class: 93 feet long, crew of 13, accommodations for 16 students, and equipped with a small laboratory.

### Vessels Under Aid Agreement

The vessels, training program, and cost of cruise to India are all included in the gift. It will be made under the 1965 Swedish-Indian aid agreement. Total cost: US\$700,000, including cost of building and US\$563,000 cost of equipping. FAO provided technical advice in selecting suitable vessels.

### Vessels for Fishermen Training

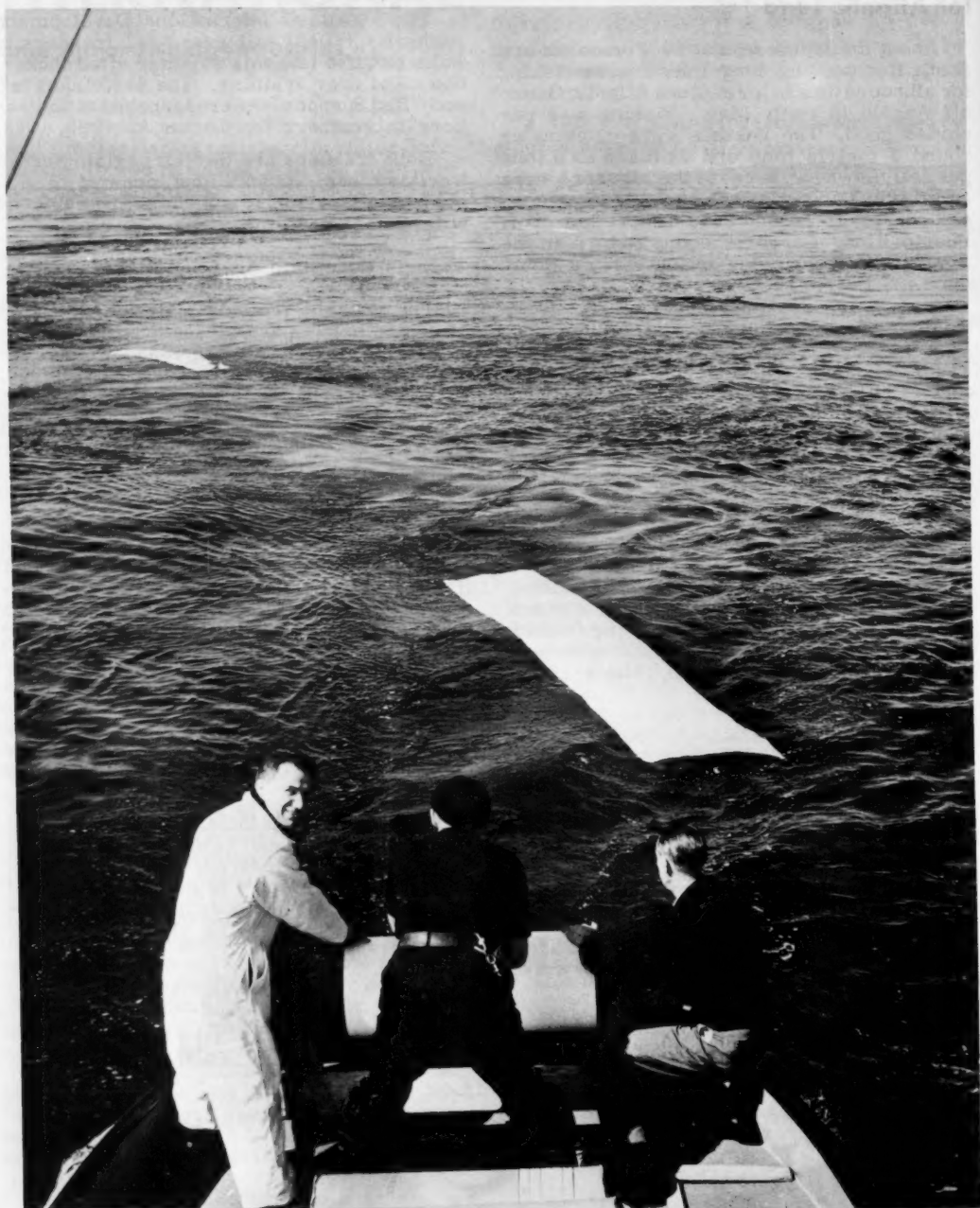
Once the trawlers have arrived in India, their uses will be determined by the Indian Government. It is expected that their main function will be to train fishermen in efficient fishing methods. Also, they will be capable of supporting research in processing and preserving fish, and in marine biology and associated sciences.

The Indian crews of four per ship--1 captain, 1 engineer, and 2 master fishermen--were scheduled to arrive in Sweden around June 1. Following training, they will sail for India at the end of August with the Swedish training crews.

After arriving in India, sometime in November, both ships will be used initially in the Bay of Bengal. At least one will operate from Madras. The Ministry of Food and Agriculture will direct their operation. (U. S. Embassy, Stockholm, May 10, 1968.)







Charting ocean currents off British Columbia with strips of paper for pollution study. (Dept. of Fisheries, Canada.)

# FOREIGN

## CANADA

### FISHERIES COUNCIL ADOPTS RESOLUTIONS

The Fisheries Council of Canada, an important national industry group, held its 23rd Annual Meeting in Vancouver, May 5-8. It elected Richard I. Nelson of Vancouver president, and adopted these resolutions:

(1) Canada either should declare immediately the straight baseline as described in the Council's brief to the Government in January 1963--enclosing her territorial sea and from which her 12-mile exclusive fishing zone would be measured--or Canada should declare immediately exclusive fishing zones only in those areas.

(2) Canada should seek early convening of a Law of the Sea Conference. The Conference could resolve matters of fishing rights and jurisdiction not met by declaration of exclusive fishing zones--particularly, international acceptance of the abstention principle for anadromous fish, and the status of marine resources over the Continental Shelf.

(3) The Federal and Provincial Governments should set up machinery to combat possible pollution from marine disasters.

(4) The Federal Government, through tax incentives, should encourage installation of pollution-control facilities in industry. In those jurisdictions where a machinery tax is levied, pollution-control facilities should be exempt.

(5) Legislation should be enacted to enforce existing legislation. It should ensure that: (a) Fisheries interests are safeguarded in all proposals to discharge industrial and domestic wastes; (b) adequate budget and facilities are made available to the Fisheries Research Board to start long-range studies to determine effect of industrial and domestic pollution on river estuaries and salt-water bodies critically important to fishing industry; (c) the Federal Department of Fisheries and appropriate Provincial Pollution Control authorities establish workable means of monitoring major industrial and domestic effluents at outfall, and create deterrent penalties

to ensure that acceptable levels of outfall are maintained; and (d) the Federal Department of Fisheries should become more actively involved in formulation of a national water policy. ("Fisheries Council of Canada Bulletin," May 1968.)

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### OPENS WORLD'S LARGEST SALMON-REARING STATION

The world's largest Atlantic salmon rearing station has begun to operate fully on the St. John River in New Brunswick. It is near the site of the Mactaquac power dam, a few miles upstream from Fredericton. The station can produce a half-million juvenile salmon to perpetuate salmon runs on the historic river that would be blocked by the 600,000-kilowatt hydroelectric plant.

Canada's Department of Fisheries cooperated with the New Brunswick Power Commission to sponsor the multi-million-dollar hatchery as the solution to the dam-created problem.

#### Salmon-Rearing Station

The 13-acre station at Mactaquac actually started to function last fall. Already, the first of future generations of salmon have been released to the rearing ponds. The 300,000 tiny salmon that emerged from the egg stage in February 1968 will be raised to the smolt or sea stage. Then they will be able to leave, in their own time, on the down-stream run to the sea.

#### Adult Salmon Selected

Adult salmon are trapped at the dam site. There, about 1,000 of the estimated 10,000 to 20,000 adult fish, which normally would migrate past Mactaquac, are selected for breeding purposes at the station. The remaining fish are transported in specially designed New Brunswick (N. B.) Power Commission trucks above the 60-mile-long headpond to meet needs of anglers in the upper reaches of the over 400-mile-long river and its tributaries.

This transport operation will leave 2 angling sites relatively unimpaired. They are

## Canada (Contd.):

on the main river between Hartland and the Beechwood dam, and on the Tobique River beyond the dam headpond.

### Salmon's Obstacle Course

If the salmon released in the Hartland-Mactaquac stretch of water successfully run the gauntlet of anglers, they can ascend the Beechwood lift. This is an electrically operated elevator-like apparatus that carries the fish over the dam. The salmon then can make their way up the Tobique dam fishway and enter the angling fishery in the waters beyond. The survivors will eventually spawn there. One reason for the special rearing facilities is that the downstream mortality of smolts imposed by 3 sets of turbines and the large Mactaquac reservoir will be heavy.

### Brood Stock Collection

The brood-stock-collection phase of the Mactaquac breeding program began in June 1967 and continued through the fall salmon run in October. The best salmon and grilse (a 3-6-pound salmon with a 1-year sea life) as determined by general health, lengths and weights, were selected from each day's catch for the brood stock. Excess fish were transferred upstream to assure fish for anglers, and a natural spawning stock for the St. John River system.

### Strongest "Races" Sought

Federal fisheries biologists are aiming at a scientifically controlled selective breeding program to produce the strongest possible "races" of salmon for the St. John River. It will take 3 or 4 years before it will be possible to evaluate the results of the breeding. Then, the program will become progressively more selective in order to use the age groups that yield the best results. (Canadian Dept. of Fisheries, May 22, 1968.)

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### REDUCTION HERRING FISHERY CLOSURE CONTINUES

No reduction herring fishing will be allowed for the 1968/69 season on Canada's west coast, the Government announced on May 3, 1968. Although spawning reports showed improvement over those of 1967/68, the worst on record, they did not justify relaxation of total closure imposed then.

Canada's Department of Fisheries is conducting research programs to aid the fishery. Also, it is trying to examine the possible use of herring for food, particularly because of its high protein yield. ("The Fisherman," May 10, 1968.)

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### FISHERMEN WILL GET EMERGENCY FINANCIAL HELP

Canada is studying conditions in the Atlantic Coast groundfish industry resulting from a depressed market for frozen fish products. The government wants to promote orderly marketing and prevent serious losses to fishermen and processors. It is prepared to give emergency financial assistance to Atlantic Coast fishermen dependent on the groundfish fishery if the 1968 season seriously depresses fishermen's incomes.

The government's deficiency payment plan will be computed on the average price per pound of catches of cod, ocean perch, and flounder received over the last 3 years.

### Government Helps

The Department of Fisheries is accelerating its programs to improve the industry. It has commissioned an in-plant efficiency study to reduce processing costs. This study will be extended to production methods and trawler efficiency.

The Federal Government is cooperating with the Provinces and the Fisheries Council of Canada in sponsoring an industry study of the Canadian market for fishery products.

New export promotion schemes are being developed to supplement the already-extensive export sales programs of the Department of Trade and Commerce. Also, the Atlantic Development Board has begun an in-depth study of marketing methods of the Atlantic Coast industry in the U. S. market.

These plans are intended to make the industry capable of holding its own in the world markets.

### Uncertain Market

Returns to fishermen for the balance of the 1968 season depend on the market situation. The market's future cannot now be determined, nor can the amount of government aid. (Canadian Dept. of Fisheries, May 23.)

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## Canada (Contd.):

1966-67 FISH MEAL PRODUCTION  
AND TRADE

Production		
	1967	1966
	.... (1,000 Lbs.) ....	
Atlantic Coast:		
Groundfish.....	76,312	83,188
Herring.....	97,686	51,762
Other.....	3,100	3,006
Total.....	177,098	137,956
British Columbia:		
Herring.....	19,356	54,362
Total meal.....	196,454	192,318

Source: "Monthly Review of Canadian Fisheries Statistics."

Imports		
	1967	1966
	... (1,000 Lbs.) ...	
From:		
Peru.....	2,085	-
United States.....	80	12,000
Total.....	2,165	12,000

Source: "Trade of Canada."

Exports		
	1967	1966
	... (1,000 Lbs.) ...	
Country of Destination:		
(A) Herring Meal & Pilchard Meal:		
United Kingdom.....	5,338	1,539
Belgium-Luxembourg.....	-	400
United States.....	69,354	71,429
Total.....	74,692	73,368
(B) Other Fish Meal:		
United Kingdom.....	16,176	24,166
Leeward & Windward Islands.....	42	50
Trinidad-Tobago.....	123	30
Guyana.....	42	-
United States.....	13,216	8,282
Total.....	29,599	32,528

Source: "Trade of Canada."

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## VESSEL INSURANCE INCREASED

Effective June 15, insurance protection provided to commercial fishing vessels under the federally sponsored Fishermen's Indemnity Plan was extended to cover craft with a maximum appraised value of C\$25,000. This supersedes the existing insurable maximum limit of C\$15,000. The minimum appraised value acceptable remains C\$250.

## Higher Costs

The extension results from higher construction costs, and the trend among fishermen to obtain larger craft capable of diversified fishing.

The Fishermen's Indemnity Plan agency has insured nearly 8,000 vessels in Canada with a total appraised value of C\$35 million. Over C\$19 million of this is in British Columbia. (Canadian Dept. of Fisheries, June 12.)

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## SMELT IS VALUABLE RESOURCE

Smelt is a valuable resource harvested commercially all year.



More than twelve and one-half million pounds of the little silver fish were taken by Ontario fishermen during 1967, principally in trawling operations. The catch was worth well over one-half million dollars to them. The economy of Ontario benefits by at least double this amount when the value of processing and related services is included.

## Much Sold to U. S.

Much of the product is sold in the United States, but Ontario retail frozen-food cabinets also are well stocked with this reasonably priced gourmet food.

Scientists have formulated effective methods of fishery management. So it is expected that this rich harvest will continue to be available for years to come--with plenty to go around for sports and commercial fishermen.





## EUROPE

### USSR

#### TRENDS IN SOVIET FISHERIES

The Soviet Ministry of Fisheries was criticized during a recent full meeting of the Central Committee of the Union of Food-Processing Workers of the USSR. Problems concerning organization of labor and increased productivity of several food-processing industries were discussed.

Speakers noted that 20 percent of all fishery enterprises failed to fulfil the 1967 labor productivity plan. The introduction of modern and mechanized equipment into the fishing industry is slow.

Most fish cleaning aboard vessels is still manual.

#### Scientists Are Ignored

N. Vaniaev, Fisheries Minister of the Russian Soviet Socialist Republic, said that the achievements of fishery scientists and engineers are being ignored. While East Germany's fleet is already using electric trawls designed years ago by a Soviet scientist, the gear will not be installed aboard Soviet fishing vessels until 1969.

Union speakers affirmed that the Soviet Ministry of Fisheries is generally indifferent to suggestions from innovators. On Jan. 1, 1968, over 7,000 suggestions were lying around untouched.

#### Construction Ministry Criticized

The Soviet Ministry of Construction also was criticized severely. The 5-Year Plan provides for construction of 1,500 food-processing plants and buildings by 1970, but actual construction lags. Only 63 percent of planned construction projects for the Ministry of Fisheries was actually built.

Other Soviet ministries fared poorly too: only 41 percent of planned construction was done for the Ministry of Power and Electrification, and 65 percent for the Agriculture Ministry.

#### Some Encouraging Reports

The Central Committee noted a few encouraging signs. New, well-equipped, enterprises raised labor productivity in the fishing industry by 8.6 percent during 1966-67. The ranks of "shockworkers of Communist labor" are constantly growing. Now this title is held by every 8th worker in the fishing industry. The title of "Communist crews" was awarded to 870 crews of fishing vessels. ("Ekonomicheskaya Gazeta," No. 19, May 1968.)

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#### FAR EASTERN FISHERY TELECOMMUNICATIONS DISCUSSED

A meeting on communications, radio navigation, and exploratory research techniques was held in October 1967 at the Fisheries Administration in Vladivostok. It was attended by inspectors of the Far Eastern fishing fleets and by representatives of the Western and the Azov-Black Sea Fisheries Administrations.

#### The Complaints

Many speakers criticized the poor use made of up-to-date telecommunications and radio navigation equipment, especially in exploration and research. They said: (1) many radio specialists at the Far Eastern Fisheries Administration lack the necessary theoretical background, (2) not enough radio specialists are graduating from the region's nautical schools, (3) most radio centers are unable to handle constantly increasing traffic, and (4) no refresher or advanced courses for radio specialists are available.

#### Reasons for Shortcomings

A resolution adopted pinpoints the causes of these shortcomings as lack of an independent agency to study fishery telecommunications problems--and an insufficient number of qualified specialists. ("Rybnoe Khoziaistvo," No. 2, 1968.)

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USSR (Contd.):

## STEPS UP FISHERY RESEARCH IN POLAR REGIONS

The Polar Scientific Research Institute of Fisheries and Oceanography (PINRO) has stepped up research by its Northern Division, especially in the White and Barents Seas.

### Polar Regions Research

Soviet scientists will study populations of salmon, whitefish, navaga (*Eleginus navaga*), and herring; stocks of marine mammals in the White and Barents Seas; availability of algae for commercial purposes. Other projects will try to improve Soviet coastal-fishing techniques and perfect the technology of processing fish, algae, and marine mammals.

### Marine Algae

The laboratory of marine algae, headed by K. Gemn, is studying algae in the gulfs and inlets of the White Sea. Tidal electric power stations will be built there. The laboratory has studied the artificial cultivation of the ahnfeltia in the White Sea, where the natural stock of this alga is depleted. Algae are of primary importance in producing agar-agar. The latter is manufactured in the USSR by only 4 plants. The plants do not meet the needs of the Soviet economy.

The laboratory of marine mammals, under A. Golechenko, is studying seal-skin processing to improve the quality of furs.

A group of scientists headed by T. Gosheva has observed systematically herring shoals in the Gulfs of Onega and Dvina. The group established new regulations for herring fishing.

### Salmon and Whitefish

Ichthyologists of PINRO's Northern Division, supervised by M. Morshtin, have investigated the population trends of Pechora salmon and whitefish. Maximum catch quotas were established to prevent depletion of these valuable species. On the other hand two fisheries experts, O. Germashev and V. Ovchinnikov, have improved techniques for intense salmon fishing in the Pechora River.

PINRO will publish soon an atlas of commercial concentrations of fish in the White Sea. ("Vodnyi Transport," May 16, 1968.)

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## STERN TRAWLER COMPLETES ANTARCTIC RESEARCH

In early May, the 3,200-gross-ton research stern trawler "Akademik Knipovich" completed her third exploratory cruise to Antarctica. The expedition was headed by Dr. A. Lestev of the Laboratory for Fishing Gear and Techniques of VNIRO (All-Union Scientific Research Institute on Sea Fisheries and Oceanography).

Research involved oceanography, biology, ichthyology, and surveys for new fishing grounds in the southern seas. The Akademik Knipovich called at the Falkland and S. Georgia Islands, and Uruguayan and Argentine ports on her way home. ("Vodnyi Transport," May 7, 1968.)

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## A. KNIPOVICH' STUDIES KRILL

The primary purpose of the third cruise of the A. Knipovich, which began Dec. 1, 1967, at Sevastopol, was to study krill resources in the South Atlantic. It is likely to be the last cruise to study this subject, which has engaged many VNIRO scientists for the past 4 years.

The Soviets have found it technologically difficult to make fish meal out of krill--and even more difficult to sell at home edible products experimentally produced from krill. ("Vodnyi Transport," May 7, 1968.)



## Norway

### THE WINTER HERRING FISHERY

The herring fishery of Norway is divided into four distinct types--small, fat, winter, and fjord herring. Winter herring are mature herring older than five years. They constitute the largest part of the total herring catch (about one-third) and are by far the most

## Norway (Contd.):

valuable. The 1968 winter herring fishery was a complete disaster. The first quarter of the year is the main season.

Winter Herring Catch, Jan.-March 1966-68			
	1968	1967	1966
	... (1,000 Metric Tons) ...		
Used for:			
Iced for export . . . . .	2.5	15.3	17.7
Frozen for export . . . . .	3.6	29.5	35.2
Salted . . . . .	1.6	13.9	17.6
Smoked . . . . .	0.7	4.4	4.4
Canned . . . . .	1.2	7.9	8.1
Industrial use . . . . .	2.4	283.4	321.8
Bait . . . . .	-	0.7	3.0
Fresh domestic consumption	2.3	1.9	1.9
Total landings . . . . .	14.4	357.1	409.7

Notes: (1) Original data in hectoliters (hl.)--converted to metric tons using 93 kilos=1 hl.  
(2) Totals may not add due to rounding.  
Source: "Fiskets Gang," March 7, 1968, No. 10.

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## POOR HERRING CATCH HURTS CANNERS

The 1968 catch of winter herring was the lowest yield recorded in this century with a total catch of about 25,600 metric tons, compared with 372,000 tons in 1967. This poor yield cannot be entirely attributed to the extremely bad weather conditions, but the fishery experts have not yet presented their views and explanations for other possible reasons. Although only about 10 percent of the year's catch was processed for fish meal and fish oil, it is a fact that Norway has had the lowest pack on record. The industry can now only rely on raw material from the North Sea herring for further production of kippers. Final pack figures are not yet available as some cannery may still have small stocks of deep-frozen raw material.

The total failure of the herring catch has completely changed the picture as regards soft herring roe. Whereas in 1966 and 1967 there were surplus stocks of soft herring roe--with the exception of  $\frac{1}{2}$  ovals during the latter part of 1967--stocks are now, at the beginning of a new sales year, practically depleted, a situation which North Sea herring can in no way rectify as this type of herring does not carry any soft roe of commercial value.

In the absence of herring, the factories have been occupied with sild sardines, mostly from deep-frozen stocks of raw material.

Thus stocks of sild sardines are at present slightly in excess of stocks at the same time last year.

Estimated exports in standard cases of quarter cans of the industry's main items as of March 29, 1968, show:

	1968	1967
Brisling . . . . .	72,000	98,000
Sild . . . . .	272,000	234,000
Kippers . . . . .	54,000	61,000
Soft herring roe . . . . .	19,000	25,000

\* \* \*

## PROTAN FREEZING METHOD IMPROVED

"Protan" is the name of the Norwegian-developed process used to freeze, in alginate jelly, round herring and blocks and to glaze some fishery products. ("Norwegian Fishing and Maritime News," No. 1, 1968.)

The object is to prevent rancidity and drying out in the frozen product during long-term storage. A new-type jelly does not require special proportioning apparatus. Only a large tank with a mechanical mixer to dissolve the powder is needed. Protection is achieved by surrounding the frozen product with a coating or film of alginate jelly. This excludes air, the cause of deterioration in the quality of products during storage at normal temperatures.

## The Method

Fresh fish or fillets are dipped or put into a solution of Frostgel Powder. Later, they are packed in lined frames, or in the packaging in which they will be frozen. During freezing, the solution will become jelly-like. Finally, it will become an ice-hard mass practically impenetrable to air. During thawing, the jelly returns to a thick liquid easily washed off with water.

Freezing of fish or fillets in Protan jelly must take place in plate freezers or tunnel freezers equipped to permit freezing of blocks under pressure. If freezing is not done under pressure, the fish will be forced up from the jelly during freezing and lie at the surface of the blocks without protection.

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Norway (Contd.):

## Basking Shark Fishery

The Norwegians have hunted the basking shark for centuries. It has always been for the liver primarily. In earlier times, however, they also used the meat--both as human food (dried) and as fertilizer--and the skin for ropes and shoes. The liver oil was used as lampfuel and for tanning. Today, it is refined into various qualities and most of it goes to the cosmetics industry. There the squalene (in which basking-shark liver oil is very rich) forms a vital part of beautifying creams and lotions. The squalene is wonderful stuff, but the limited supply restricts the variety of uses. The liver oil is in high demand and brings a good price.

### The Fishery

Today, the fishery is conducted by wooden boats of various types: 50-70 feet, load 20-50 tons, make 8-10 knots, and use a small whale gun. Many fishermen go after both basking shark and small whale.

The season starts in April-May, but sometimes as early as mid-March large schools of basking sharks may be spotted. The peak is usually in June, and the season ebbs in August. Sometimes September may see good catches, but at that time most catchers have switched to other fisheries--shrimp trawling, or "helpers" to the big herring purse seiners.

The basking shark is caught all along the coast of Norway, from the Kattegat to the Barents Sea, and on the banks of the North Sea. Some of our fishermen go as far as west and south of Ireland, much to the irritation of the Irish who sit on shore, waiting for the shark to come to them. The Shetland-Tampen area and the banks off Nordland and Troms are the main hunting grounds.

### Little Known About Shark's Habits

Little is known about the habits of basking sharks. Two theories have been put forth regarding their migrations. As they usually are first encountered off Ireland, then on the North Sea banks, and last off northern Norway, it was accepted that the fish spent the winter in the southern part of their distribution area, and moved north in the summer to return in the fall. But closer investigations found large schools of basking shark off Finnmark sometimes as early as March, and this did not agree well with the long south-north migration theory. On the basis of new data, a new theory was formed: The fish are more

stationary. As a rule, they form various local populations within their distribution area. The whole North Atlantic, north of the tropics, and the Mediterranean are considered one distribution area. The fish stay in holes and trenches along the edge of the continental shelf in a kind of hibernating condition. They live on the energy accumulated in the liver. When the plankton blossom in spring and summer, the fish come up and over the banks to the coast.

To find the truth, we must tag the fish. Both England and Norway have tried to tag basking sharks. No experiments have been successful yet, but we hope to tag a few this summer (1968).

### Equipment Used

A small whale gun is used to take the fish, but the harpoon and wire differ from whaling equipment. Figure 1 shows the rigging of the sharking equipment. The harpoon (figure 1 A) weighs 18 kilos. A steel wire of about 20 meters is fastened at its balance point. The wire is shackled to a thick, very elastic, nylon rope, and fastened about the bow outboard with easily-breakable string (figure 1 B). The nylon rope goes over a block, hanging from a gallow or standing on the rail on starboard, along the deck, over a block beside the wheelhouse and up to the winch (figure 1 C).

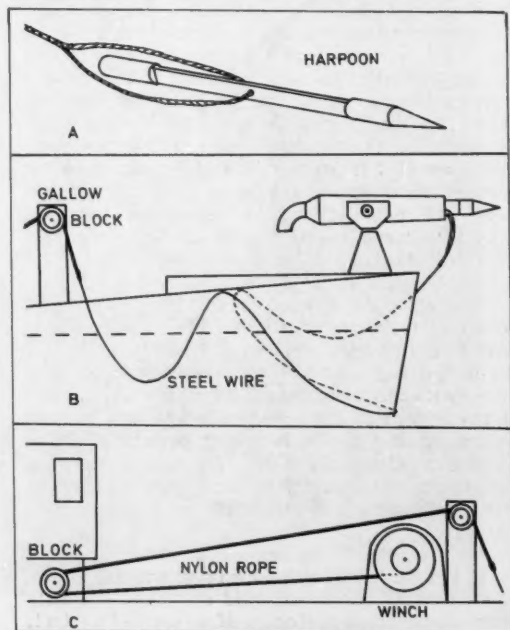


Fig. 1 (a, b, c) - Rigging of the sharking equipment.

## Norway (Contd.):



Fig. 2 - Combined trawler and basking shark hunter.

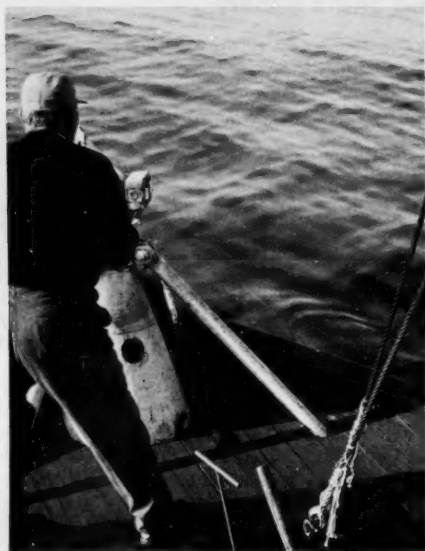


Fig. 4 - Ready to fire. Shark's shadow may be seen right under bow.

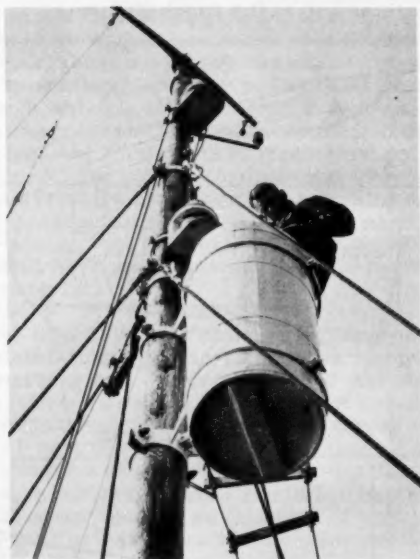


Fig. 3 - The lookout in crow's nest.



Fig. 5 - Killing shark with a carbine bullet.

## Norway (Contd.):



Fig. 6 - Trying to get a loop around a pectoral fin.

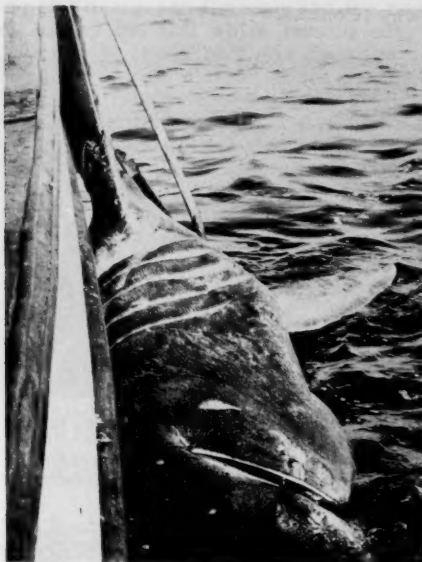


Fig. 8 - Taking out the harpoon. Skin shows uneven distribution of pigments.



Fig. 7 - Hanging in a loop by the pectoral fin.



Fig. 9 - Cutting out the liver.



## Norway (Contd.):



Figs. 10 &amp; 11 - Heaving liver on board and dropping it into hold.



Fig. 12 - Basking shark fleet at Traena on Arctic Circle (midnight June 27-28, 1967).

## Norway (Contd.):

### Fishing Technique

The boats are manned by 3 to 5 fishermen, who sail out to the grounds where tradition has it basking sharks should be at the time. They also cooperate with other fishermen, who will call them by radio if they see anything. The basking shark hunters have accumulated knowledge through generations, and their strong intuition impresses an outsider. But very little has been written down.

The fishery demands good weather because fishermen depend on seeing the dorsal or upper caudal fin above water. When the wind is fresh (force 5), one usually has to give up. Everybody on board is on the lookout for the black triangle that means fish. There is a crow's nest in the main mast, and many boats also have a wind screen and an extra wheel on top of the wheelhouse, so the helmsman too gets a better view.

### Shark Ahoy!

On spotting a fish or a school, the gunner runs to the bow. They close in on the fish from behind. If there is a school, they choose the hindmost fish, hoping not to scare the others down at the first shot. If the fish goes down and no fin can be seen, the lookout in the crow's nest can still direct the chase as long as the fish stays just under the surface. But that is the limit; if the fish goes deeper, the fishermen can only wait. The harpoon would lose its momentum in the water, and there is no use firing unless the fish is close to the surface.

One does not fire until close upon the fish. One aims at the thickest part of the fish, and the harpoon goes right through the body. The harpoon, which is attached to the wire at balance point, will lay at a right angle to the wire when hauled in and make a good stopper. If the harpoon does not go right through, it may be pulled back the way it went in, and the fish will be lost.

### Coup de Grâce

The hauling in starts immediately. When the fish is under the starboard bow, the gunner kills it with a carbine bullet through the brain. This may be difficult and will take some time if the fish keeps its head down. All

the splashing and fighting, and the risk of being hit by the tail while leaning out over the rail, make it difficult and dangerous.

When the fish is dead, a loop is put around one of the pectoral fins, and the fish is thus turned belly up. Now hanging by the loop, the harpoon wire is shackled out. The harpoon is taken onboard by a long hook, and the wire is hauled through the fish. When this is done, the gunner cleans and reloads the gun. He uses 40 grams of black gun powder. The belly is cut open by a long knife and the liver taken out. When the liver floats freely, the body is let go. The liver is cut into pieces, hauled on board, and dropped into the hold.

The whole operation, from the time trigger is pulled until crew is ready for the next fish, may take only 6 minutes under ideal conditions, I have been told, but an average of 15 minutes should be a realistic estimate.

The hunt is best in the morning and in the evening. Usually, there are few or no fish to be seen about noon. So the fishermen take 2-3 hours siestas and get a very welcome rest--because the fishery begins at 5 in the morning and often lasts until midnight.

### The Industry

The fishermen have an organization in Brandal (Aalesund). When the boats are loaded, they contact the office, which directs them to one of the three factories that process basking shark liver oil, usually the nearest one. These factories are at Haugesund, Flesland (Bergen), and Brandal. The whole year's catch is sold beforehand at an agreed price based on 70% oil content; the price varies with the percentage.

The basking shark fishery is becoming popular as the oil price goes up. In 1967, 53 boats achieved a fine record: over 2 million kilos of liver, about the same as the record year of 1960. In 1966, 30 boats produced about 900,000 kilos of liver. The coming season may see a hundred boats on the hunt. Research should be intensified to find the optimum yield.

--By Sigmund Myklevoll  
Research Assistant  
Institute of Marine Research  
Bergen, Norway



## East Germany

### RATES THIRD IN WORLD SHIPBUILDING FOR FISHERIES

The shipyards at Rostock, Wismar, and Stralsund in East Germany are continuously building new fishing and research vessels. Over 14 percent of the world's fishing vessels are built in East German shipyards. The nation now holds 3rd place in world fishing-vessel construction.

Recently, 150 fishing vessels with a total gross tonnage of 170,000 were ordered by various countries. One of East Germany's largest customers is the USSR--42 vessels were built for her in 1967. ("Vodnyi Transport," Oct. 7 and 26, 1967.)



## France

### STRIKES LIMIT IMPORTS OF FISHERY PRODUCTS

Strikes developed in the French fishing industry during the second half of February. They started in the Mediterranean ports to protest low prices for sardines. They spread to the North Sea industrial ports, where strikers sought to obtain proper controls over improper and uncontrolled imports of basic fishery products.

The fishermen of Marseilles requested the establishment of a compensation fund to support the sardine market, a fixed sale price for sardines, and a freeze on sardine imports.

The fishermen of Boulogne, Dunkerque, Dieppe, Fecamp, Cherbourg, and other northern fishing ports requested, under article 44 of the Treaty of Rome, that the minimum price system be extended to other fish species to give the market a "shot in the arm."

#### Government Acts

The strikes were settled only after the French government decided to take measures to protect the sardine fisheries; also, to establish immediately minimum import prices for 5 more fish species. On February 27, the French "Official Gazette" began publishing the new minimum import prices. At the same time, appropriate steps were taken at the European Economic Committee.

By the setting of firm controls over imports--and by regulating the domestic sardine market--the worries of the industry were eliminated. ("La Pesca Italiana," April 4, 1968.)



## Iceland

### SHIPBUILDING IS INCREASING

Until a short time ago, Iceland ordered nearly all her steel-hulled vessels abroad. Now the domestic building of these vessels is increasing.

Recently, 2 steel-hulled fishing vessels were launched for Icelanders. The vessels totaled over 360 gross tons. There also are plans to build 2 coastal vessels in the Akureyri shipyard, though vessels of that size always were built abroad.

Many Icelandic fishing vessels have been built in Norway in recent years. For example, Kaarbos Mekaniska Verksted recently launched the twelfth and started immediately on a thirteenth. ("Atlantic and Iceland Review," No. 1, 1968.)

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### NEW OCEANIC RESEARCH SHIP PLANNED

Preparations to build a new Icelandic oceanic research vessel for launching in 1969 are under way. It is to be named "Bjarni Saemundsson," after a pioneer of Icelandic fishery research.

The vessel will be about 800 gross tons and equipped with 3 main engines driving dynamos that will provide its power. This will be the first electrically propelled vessel in Icelandic ownership.

#### Very Modern Vessel

The equipment is designed to eliminate vibration and provide better conditions for research on board. One novelty is mounting fish-locating apparatus on a movable platform. The platform remains level when the ship rolls, so radar search-beams are not affected. Only one other vessel so equipped has been built in Western Europe.

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## Iceland (Contd.):

## 1967 HERRING CATCH WAS LOW

In summer 1967, 160 herring vessels fished from Icelandic ports, 60 fewer than in 1966. The season's fishing was characterized chiefly by the great distance vessels had to go to fish: often 600-700 miles from the Icelandic coast, all the way to Spitzbergen. The herring vessels also fished off Shetland and landed some of their catch abroad.

## Catch Nearly Halved

In late December, the catch had reached 343,000 metric tons, considerably less than the 1966 period's 667,000 tons. Of this, about 288,000 tons were used for meal and oil and over 300,000 barrels were salted.

\* \* \*

## STOCKFISH EXPORTS DROP

The year-old Nigerian civil war has seriously affected one of the most important markets for Iceland's stockfish. By far the greatest part was sold to Nigeria, a substantial quantity to Italy, and a little to Sweden. In 1966, 8,217 metric tons were sold to Nigeria, while in 1967 only 2,188 tons. As a result, unsold stockfish now amount to 6,300-6,600 tons.

## Producers Ask Government Help

The stockfish producers have to pay interest on loans and meet large storage costs for stocks. They do not know when, or at what price, they will sell them. So they have asked Government aid.

## Uncertain Future

Even if the Nigerian war ends soon, some time is likely to elapse before normality returns. Moreover, market prospects have not been improved by the recent increase of import duty on this article. An attempt has been made to find new markets for stockfish in other African states, but so far without much success.



## Sweden

## FISHERMEN HAVE MARKET PROBLEMS

Swedish fishermen are experiencing serious difficulties because of a poor supply of fish--North Sea herring normally landed directly in Danish ports--and low prices in domestic and foreign market. Representatives of fishery organizations claim that Swedish fishermen during the last two years have suffered a 30-percent reduction in salary.

The present situation is considered the most critical for fishermen in 30 years. Relatively large investments in craft and gear have resulted in severe effects in many cases. Owners of large steel trawlers report that income during the last few months did not cover interest on loans which, in many cases, exceed US\$193,000.

## Foreign Devaluation

The marketing difficulty is not the only problem. Reportedly, fisheries in other Western European countries have encountered sales difficulties and low prices, both for fresh fish and prepared fish products. Swedish fishermen claim that one reason for the severe situation is the increasing import of fish and fish products. The devaluation in Denmark, Iceland, and Great Britain last fall has resulted in rapid expansion of imports from these countries. Direct landings in Denmark by Swedish fishermen are now less profitable. Trade in fish products for 1967 produced an import surplus of US\$26.7 million, compared with only US\$14.3 million in 1965.

An example of the marketing difficulties facing Swedish fishermen was illustrated in Goteborg recently, when 25 metric tons of fish, mackerel, and cod intended for human consumption remained unsold. These had to be turned over to a fish meal plant. (U. S. Consul, Goteborg, May 6, 1968.)



## United Kingdom

### FISHING INDUSTRY TO GET INCREASED SUBSIDIES

The British fishing industry will receive increased subsidies as soon as details are worked out. Current proposals call for increased loans for new vessels in both inshore and herring fleets, a more lasting operational subsidy for deep-sea fleet, and elimination of scrapping restrictions. Legislation also will be introduced in Parliament to end the automatic reduction of operating subsidies in existence since 1961.

Despite these proposed increases, the industry is not quite satisfied. It wants some limitation on imports. (U. S. Embassy, London, May 18, 1968.)

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### MARINE OILS GAIN AT HOME

The highlight of British consumption of fats and oils last year was a considerable increase in use of marine oils (prices have been falling) and a decline in vegetable oils. Trade in fats and oils reflected the consumption pattern; imports of marine oils went way up. Two chief uses of fats and oils are in margarine and cooking fats. The switch from vegetable to marine oils is most evident.

### Fish Oil Price Falls

The price of fish oil declined steadily during second-half 1967, Peruvian oil dropped from US\$142 a long ton in June to \$103 a ton in December. By April 1968, the price was down to \$93. Whale oil prices show similar downturn. A recent purchase of 16,000 tons of whale oil--half from USSR and half from Japan--reportedly cost \$103.20 a ton. This compares with almost \$144 a ton for 34,500 tons in 1967.

### Marine Oil Imports Rise

Imports of marine oils during 1967 went up 60 percent--to 281,900 long tons. Purchases of whale oil and fish oil increased, the latter by 53 percent. Stocks of marine oils at year end reached a very high level of 67,300 tons, compared with 28,200 a year earlier.

Total use of marine oils in 1967 did not rise as much as imports--only 13 percent above 1966 level. Because of their improved competitive position, these oils most likely will gain in British fats and oils market. ("Foreign Agriculture," May 27, 1968.)

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### NEW BOOK ON FISH FARMING

"Farming the Edge of the Sea," by E. S. Iverson, is a valuable book for persons interested in sea farming. It covers the present status of the industry and describes many farmed species. It looks at the biology of each species, describes the farming procedures, emphasizes the problems encountered, and discusses expansion in the years ahead. Also, it evaluates the practicability of farming species not yet farmed.

The book is available from Fishing News (Books) Ltd., 110 Fleet St., London E. C. 4, England, at US\$10.50.



## Poland

### BUILDS NEW SERIES OF STERN FREEZER TRAWLERS

The Polish Design and Research Center at Gdynia has designed a new class of freezer trawlers. The first 800-displacement-ton unit in this series was scheduled for launching by the Gdynia Shipyard in May. The new (B29) stern freezer trawler is intended to fish in the North and Central Atlantic for bottom and pelagic fish. The vessel is 246 feet long, will have crew of about 60, sea endurance of 60 days, and holds with over 1,000 cubic meters of space.

The trawler has 2 continuous decks--a main and a work deck, and a 3-tier superstructure. The work deck length from stern ramp to trawl winch is about 118 feet. This simplifies handling of fishing gear. She is built and equipped to fish, process and fillet, freeze, and produce fish meal.

The propulsion machinery is remotely controlled from a console in a separate



## Poland (Contd.):

soundproof control room located in the engineroom--or from a console in the wheelhouse, where a trawl winch control console is also located.

## Processing Fish

While designing the trawler, special attention was paid to the transport and processing of fish: (1) The transport of fish between sorting room, refrigeration space and holds, and transport of offal to fish-meal plant and of ice to the sorted fish containers, is mechanized. Different types of conveyors are used. The fish working rooms are adapted for partly mechanical sorting of fish. (2) The new trawler is equipped with vertical contact plate freezers with a capacity of 30 tons per 24 hours using Freon 12. Two Bader 33 filleting machines will also be installed. To utilize fish offal, a fish-meal plant capable of processing 25 tons per 24 hours will be provided. Two flake ice producing machines will have a total output of 16 tons per 24 hours. The fish will be kept in holds refrigerated down to  $-18.4^{\circ}\text{F}$ . by Freon 12-using equipment.

The first 8 units of the new series of freezer sterntrawlers have been ordered by Polish owners. The vessels are scheduled for delivery between 1968 and 1969. ("Polish Maritime News," May 1968.)



## Denmark

## THE 1966-67 MARINE OIL MARKET

In 1967, production of crude marine oils, mainly herring oil, increased by 25,549 metric tons to 62,686 tons. Imports were down 2,813 tons to 20,236 tons; Iceland was the main supplier. Exports increased 28,394 tons to 62,608 tons; the United Kingdom was the main customer. Consumption declined 3,441 tons to 22,328 tons in 1967.

Production of hardened and refined marine oils and animal oils was almost unchanged in 1967. Imports increased 51 percent to 19,001 tons. Peru supplied refined marine oils, and Norway and Sweden hardened oils. Consumption increased 5,423 tons to 40,014 tons in 1967, compared with consumption of 17,965 tons in 1966.

Supply of Marine Oils, 1966-67							
	Stocks Jan. 1	Production	Imports	Total Supply	Exports	Consumption	Stocks Dec. 31
	(Metric Tons)						
<b>MARINE OILS:</b>							
<b>Crude:</b>							
<b>Fish Oil (incl. herring oil):</b>							
1967 .....	5,464	62,684	19,426	87,574	62,279	21,822	3,473
1966 .....	5,286	37,037	21,701	64,024	33,385	25,175	5,464
<b>Whale Oil:</b>							
1967 .....	155	2	0	157	0	25	132
1966 .....	130	100	0	230	4	71	155
<b>Other Crude Marine Oil:</b>							
1967 .....	1/	1/	810	810	329	481	1/
1966 .....	1/	1/	1,348	1,348	825	523	1/
<b>Total Marine Oils, Crude:</b>							
1967 .....	5,619	62,686	20,236	88,541	62,608	22,328	3,605
1966 .....	5,416	37,137	23,049	65,602	34,214	25,769	5,619
<b>Marine Oils &amp; Animal Oils, Hardened or Refined:</b>							
1967 .....	1/	2/22,000	19,001	41,001	987	40,014	1/
1966 .....	1/	2/22,000	12,609	35,609	1,018	34,591	1/

1/Not available.

2/Preliminary.

Source: U. S. Embassy, Copenhagen, April 18, 1968.



## LATIN AMERICA

### SPINY LOBSTER FISHERY

U. S. Embassy reports from Brazil, Colombia, and the Dominican Republic provide these important data on the spiny lobster fisheries of the 3 nations:

#### Brazil

The Brazilian spiny lobster fishery is open all year, except for 2 areas where fishing is prohibited:

- (i) Between latitude  $33.30^{\circ}$  and  $7.50^{\circ}$  S., and
- (ii) Between longitude  $39.7^{\circ}$  and  $38.48^{\circ}$  W., to 3 miles from shore.

Lobsters must have a minimum size of 50 millimeters cephalothorax measurement.

The fishery includes 30 vessels of 15 meters or over, and 120 under 15 meters (49 feet). These are manned by an estimated 500 fishermen.

Recent export prices were US\$1.25 to \$1.40 a pound.

Annual catches have been:

State	1967	1966	1965	1964	1963
	(Metric Tons)				
Ceara	1/	1,103	1,559	1,332	1,592
Pernambuco	1/	707	547	423	247
Rio Grande do Norte	1/	864	1,180	1,451	1,504
Other	1/	56	44	45	191
Total	2/1,007	2,730	3,330	3,251	3,534

1/Not available.  
2/Estimate.

#### Exports:

Fresh, Chilled, or Frozen <sup>1/</sup>			
Year	Total	To U.S.A.	Value Total Exports
	.. (Metric Tons) ..		US\$Millions
1967	975	974	2.7
1966	1,123	1,116	3.8
1965	1,181	1,174	3.6
1964	1,577	1,573	2.6
1963	1,778	1,775	3.5

1/Fresh and chilled, probably whole lobsters, and frozen, mostly tails. No breakdown available, though bulk of exports are assumed to be mostly frozen tails.

Nominal exports, 1 to 16 tons a year, have been made to Argentina, Spain, the Netherlands, and Sweden.

### Plans for Future Production

The catch has been declining due either to migration of lobsters or overfishing, or both. It is not expected to exceed 1,700 tons a year over the next 5 years. It is anticipated that 99 percent of the exports will continue to go to the U.S. (U. S. Embassy, Rio de Janeiro, May 17, 1968.)

#### Colombia

Little spiny lobster fishing is done on the Pacific coast. Most lobsters are caught on the Atlantic coast.

The Colombian Ministry of Agriculture reported these landings of spiny lobster:

	Metric Tons
1967	22
1966	21
1965	19
1964	17
1963	16

Export figures are not readily available. However, the following data indicate the export level. Most frozen lobsters are exported. Colombia does not can lobster.

	Metric Tons
1967	16
1966	15
1965	14
1964	13
1963	10

### Laws About Lobster

Colombian law prohibits lobster fishing from April 1 to Aug. 31 in the Atlantic littoral; forbids catching, of lobsters under 25 centimeters; and requires that a certain percentage of the catch, in practice seldom more than 20 percent, be made available for national consumption. Fines for violations of the first 2 articles may range from 1,000 to 100,000 pesos (US\$80-8,000).

### The Fishery

About 400 fishermen, mostly Indians from Guajira, fish lobsters. They use small boats and dive for lobsters. Current Bogota price for lobster is 32 pesos (US\$2.50) a pound.

## Colombia (Contd.):

Almost all lobster fishing is done off the Guajira coast in the Atlantic, particularly in the Cabo de Vela area. Some lobster fishing is done off Tumaco near the Ecuadoran border.

The principal exporting firm is Mariscos del Caribe. Two new firms, German-owned, Langosta del Caribe, and Guajira Costa Norte, plan operations soon. (U.S. Embassy, Bogota, May 21, 1968.)

## Dominican Republic

The Dominican lobster fishing season runs from Jan.-Feb. and Aug.-Dec. The number of lobster fishermen is not known, but the total number of all types of licensed fishermen is 5,364.

Prices are approximately \$0.72 per kilo (\$0.33 a lb.). The number of vessels of all types in 1967 was 1,422. There is no breakdown for lobster vessels only. Areas of greatest activity are the waters around ports of Sanchez, La Romana, and Pedernales.

## Fishery Limited

Due to the narrow undersea shelf surrounding the Dominican Republic, the areas where spiny lobsters may be taken are definitely limited. As a result, there is little possibility of substantially expanding the catch. The Dominican Republic cannot be considered a potential supply source of any importance for the U. S. market. (U. S. Embassy, Santo Domingo, May 19, 1968.)

Annual Catch					
1967	1966	1965	1964	1963	1962
.....(Metric Tons).....					
62.8	92.1	73.6	76.1	56.0	42.8
			Exports		
			1967	1966	
			.....(Metric Tons).....		
Frozen lobster	.....	.....	19.6	30.4	
Live lobster	.....	.....	-	1.2	
Lobster tails	.....	.....	1.7	1.1	
Note: All shipped to Puerto Rico in 1966; Puerto Rico and Curacao (0.2 tons) in 1967.					



## Mexico

NEW MARINE SCIENCES SCHOOL  
OPENS IN MONTERREY

On April 19, 1968, the Monterrey Institute of Technology and Superior Studies officially inaugurated a new school of marine sciences; the Escuela de Ciencias Maritimas y Tecnologia de Alimentos Guaymas. Present were 200 guests. The Rector said that the school would grant degrees in marine sciences. Through fisheries research, it would seek to provide more food (from Gulf of California) and serve the economic needs of Mexico.

## The School

The new school is a 2-story, concrete building 100 yards from the sea. The first floor has an aquarium; biology lab; a food-analysis lab; and a small but good pilot plant for experimental food production. The plant includes a large storage freezer, fast freezer-dryer, a thermal dryer, and a vacuum can sealer. On the second floor are 2 spacious lecture rooms, a modestly equipped oceanographic lab, a library, offices, and physiology and biochemistry lab. The labs can accommodate about 30 students each. Almost all equipment is U. S. manufacture, with a few Japanese meters and Swiss analytical balances.

## 61 Students

The school has operated a full semester with 61 students and 7 teachers. Next semester there will be about 100 students. The capacity of about 200 should be reached shortly thereafter. The director is Dr. Henry J. Schafer, a Mexican, with PhD from the University of Miami.

## Land Donated

The land for the school was donated by a private citizen. The Ford Foundation contributed US\$175,000, the Inter-American Development Bank US\$200,000, and the Institute the rest.

The school is well coordinated with other institutions in teaching marine sciences.



## ASIA

### Japan

#### CONTINUES ALBACORE PRICE STABILIZATION PROGRAM

The Federation of Japan Tuna Fishermen's Cooperative Associations (NIKKATSUREN) plans to implement again in 1968 the albacore price stabilization program. Under this program, developed in 1965, NIKKATSUREN buys and stores albacore when heavy summer landings threaten to reduce prices below a certain level. The fish are released later, at home or abroad, when they would not glut the market. In 1966 and 1967, NIKKATSUREN had little need to do this because of high prices.

#### Albacore Season Starts Slowly

This year, the summer albacore fishery is off to a slow start. The outlook is not promising. So, depending on the season's outcome, NIKKATSUREN again may not have to carry out its program.

In 1967, the organization purchased 181 tons of albacore, which were processed into canned tuna in oil and sold at home. ("Katsuo-maguro Tsushin," May 7, 1968, and other sources.)

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#### CANNED PINK SALMON PRICE REDUCED

The Japan Canned Salmon and Crab Sales Co., Ltd., announced on April 1 an advertising allowance of US\$1 a case on canned pink salmon, No. 2 cans ( $\frac{1}{2}$ -lb. flat). Quotations for areas A and C (U. S. and Canada, and countries other than U. K., Australia, and New Zealand) remain at \$14 for fancy grade and \$13.50 for standard grade.

#### Opportunity Missed in 1967

In summer 1967, there was some demand for Japanese canned pink salmon in the U. S. If the sales company had deducted \$1 from the public quotation (trading companies wanted this), a considerable amount could have been sold there. The land packers, however, never agreed, although the ocean packers wanted to dispose the stock at the reduced price.

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#### 12 BOTTOMFISH MOTHERSHIP FLEETS WORK IN BERING SEA

The 12 Japanese mothership fleets licensed for the 1968 Bering Sea bottomfish fishery were operating full scale with the arrival of the last mothership. The latter left Japan April 27. The fleet catch, Jan.-April 1968, was about 200,000 metric tons--about 45,000 tons ahead of the same 1967 landings of 156,500 tons. There is considerable interest in whether the Bering Sea fleet this year can equal or surpass the 1967 record catch of 770,000 metric tons of bottomfish. ("Suisancho Nippo," May 1, 1968.)

The 1968 Bering Sea mothership fleet and assigned catch targets are:

Mothership	Size	Catch Target
	Gross Tons	Metric Tons
"Banshu Maru No. 5" . . . . .	3,678	5,620
"Kanshima Maru" . . . . .	7,163	7,820
"Kazushima Maru" . . . . .	3,757	2,460
"Seifu Maru" . . . . .	8,269	22,700
"Oshima Maru" . . . . .	Unknown	4,680
"Nishin Maru No. 2" . . . . .	27,035	127,400
"Soyo Maru" . . . . .	11,192	115,990
"Gyokuei Maru" . . . . .	10,357	148,140
"Shikishima Maru" . . . . .	10,144	103,200
"Hoyo Maru" . . . . .	14,094	121,717
"Chichibu Maru" . . . . .	7,472	8,000
"Kotoshiro Maru" 1 . . . . .	Unknown	Unknown
Total . . . . .		667,727
1/Probably "Kotoshiro Maru No. 28" (572 gross tons).		

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#### 1968 SALMON DELIVERY PRICES SET

The Japanese Northern Water Salmon Mothership Association and the National Federation of Salmon Fishing Cooperative Associations (NIKKEIREN) agreed May 13 on 1968 salmon delivery prices. NIKKEIREN represents owners of gill-net fishing vessels assigned to the salmon motherships.

Salmon Price Agreements					
Species	1968	1967	1966	1965	1964
	(Cents/Lb.)				
Red . . . . .	30.7	31.3	31.3	30.7	27.4
Chum . . . . .	20.2	19.2	17.9	16.6	14.9
Pink . . . . .	14.9	14.9	14.4	13.4	11.9
Silver & king . . . . .	20.9	20.9	19.6	18.1	16.2

The new prices are a 0.6 U. S. cent a pound decrease for reds, and a 1-cent-a-pound increase for chums over 1967 prices. There was no price change for other species. ("Nihon Suisan Shimbum," May 17, 1968.)

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## Japan (Contd.):

## 1968 SALMON QUOTAS ALLOTTED

The 1968 Japanese salmon catch quota of 93,000 metric tons was set at the recent annual meeting of the Japan-USSR Fisheries Commission. It was allocated for Area A (North of 45° N. latitude) and Area B (South of 45° N. latitude) as follows:

Area	Type of Operation	Catch Quota		
		1968	1967	1966
		. . . (Metric Ton) . . .		
A	Mothership fishery, . . . . .	37,763	42,635	38,981
	Land-based gill-net fishery	8,737	9,865	9,019
	Total. . . . .	46,500	52,500	48,000
B	Land-based gill-net fishery	27,420	33,000	28,390
	Land-based long-line fishery. . . . .	12,180	14,700	12,610
	Land-based vessels under 7 tons . . . . .	3,950	4,400	4,000
	Japan Sea gill-net fishery. .	2,950	3,400	3,000
	Total. . . . .	46,500	55,500	48,000
Grand Total . . . . .		93,000	108,000	96,000

("Nihon Suisan Shimbun," May 17, 1968.)

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## SALMON MOTHERSHIPS DEPART

Eleven Japanese salmon motherships, accompanied by 369 catcher vessels, departed Hakodate, southernmost Hokkaido, on May 15, 1968, for the fishing grounds in the Bering Sea and North Pacific Ocean. ("Nihon Suisan Shimbun," May 17, 1968.)

Name of Mothership	Size	Owner
	Gross Tons	
"Shinano Maru"	9,048	Nichino Gyogyo
"Chiyo Maru"	7,149	Taiyo Gyogyo
"Nojima Maru"	8,815	Nihon Suisan
"Meisei Maru No. 2"	9,356	Nichino Gyogyo
"Jinyo Maru"	7,161	Hokkaido Gyogyo Kosha
"Kizan Maru"	8,622	Nichino Gyogyo
"Meiyo Maru"	7,152	Hakodate Kokai
"Kyokusan Maru"	10,757	Kyokuryo Hoge
"Otsu Maru"	8,033	Hoko Suisan
"Miyajima Maru"	9,612	Hokoku Suisan
"Meisei Maru"	8,571	Nichino Gyogyo

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FROZEN TUNA EXPORTS  
DECLINED SHARPLY IN 1967

The Japan Frozen Foods Exporters Association reports that frozen-tuna exports in business year 1967 (April 1967-March 1968) declined sharply. Shipments to the U. S., based on exports approved by the Association,

were 67,787 short tons, down about 30,000 tons from BY 1966 exports of 98,955 tons. The decline is attributed to slow sales in early 1967 and to the record 1967 U. S. skipjack catch of about 103,000 tons.

## Exports to Europe Decline

Exports to Europe also dropped sharply. These were 35,536 metric tons, compared with 52,000 tons in BY 1966. Much of this was due to reduction in direct exports from Japan because local demand for tuna was brisk. Direct exports in BY 1967 to Italy declined by about 13,000 tons, and to Spain by 5,000 tons, from BY 1966.

## To Overseas Bases

Exports to overseas bases in BY 1967 were about 16,400 metric tons, down about 5,000 tons from BY 1966. This resulted largely from tuna fleet expansion by South Korea and Formosa, and to reduction of Japanese overseas-based fleet. Exports to American Samoa alone decreased by about 3,000 tons from BY 1966. ("Nihon Suisan Shimbun," May 20, 1968.)

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SUMMER ALBACORE TUNA  
FISHERY IMPROVES

The Japanese summer albacore tuna fishery, off to a slow start in early April, is improving. Landings at the leading tuna port of Yaizu still lag far behind 1967's--4,108 metric tons during April 1-May 29, 1968, compared with 8,292 tons in 1967 period. But vessels were returning to port in late May with larger albacore catches. So prices have dropped somewhat.

## Prices Drop Slightly

On May 29, pole-caught albacore of 37-40 pounds were sold at US\$469-474 a short ton, ex-vessel, compared with earlier prices of around \$500 a ton. In view of improved prospects, one Yaizu tuna packer, who had agreed to a rotation system of buying to keep prices from advancing further, decided to discontinue the practice. ("Suisancho Nippo," May 30.)

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## Japan (Contd.):

## YAIZU'S APRIL LANDINGS RISE

April 1968 fish landings at Yaizu totaled 16,368 metric tons worth about US\$6.13 million, according to the Yaizu Fishery Cooperative Assoc. Compared with April 1967, this was an increase of 1,624 tons and \$580,000. ("Suisancho Nippo," May 9, 1968.)

	Quantity			
	1968	1968	1967	
	April	March	Jan.-Apr.	April
	(Metric Ton) . . . . .			
Tuna:				
Bluefin/ . . . . .	5,133	4,906	18,859	4,734
Albacore . . . . .	1,241	1,521	3,958	2,412
Skipjack . . . . .	5,686	4,717	17,981	3,206
Mackerel . . . . .	3,650	5,288	13,783	3,757
Others . . . . .	658	570	2,255	635
Total . . . . .	16,368	17,002	56,836	14,744
Average Price				
	1968	1967		
	April	March	April	
	. . . (US\$/Short Ton) . . .			
Tuna:				
Bluefin/ . . . . .	617	670	570	
Albacore . . . . .	406	358	405	
Skipjack . . . . .	242	214	258	
Mackerel . . . . .	88	93	96	

1/Includes yellowfin and big-eyed tuna.

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FROZEN TUNA EXPORT PRICES  
TO U. S. IN MAY

The Japan Frozen Tuna Exporters' Assoc. reported these May frozen tuna export prices to U. S.:

Species	Prod.	Low	High	Avg.
		(US\$/Short Ton f.o.b. Japan)		
Albacore . . . . .	Rnd.	460 (380)	470 (410)	465 (404)
Yellowfin . . . . .	gilled & gutted	354 (320)	380 (395)	373 (339)
Albacore . . . . .	loin	940 (806)	975 (850)	952 (837)
Yellowfin . . . . .	loin	820 (722)	835 (770)	829 (753)

Note: May 1967 prices in brackets.

Source: Fisheries Attaché, U. S. Embassy, Tokyo, June 7.

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INCREASES TRAWLING  
OFF U. S. EAST COAST

In mid-March 1968, the Japanese Nihon Suisan Fishing Co. sent its 2,500-gross-ton trawler "Kiso Maru," based at Las Palmas, off the U. S. east coast to explore its commercial potential. In April, that firm sent another 2,500-ton trawler ("Kaimon Maru") on a similar expedition. On May 8, Nichiro Gyogyo's "Akebono Maru No. 51" (1,500 gross tons) left Shimonoseki for exploration off Florida coast. A Nichiro-affiliated firm is expected to send its trawler "Chitose Maru No. 18" (1,800 gross tons) to that region. Taiyo Gyogyo was scheduled to dispatch its 1,800-ton trawler "Taiyo Maru No. 65" from Las Palmas on May 10; in late May, 1 or 2 more expeditions were planned. Nihon Suisan also plans to send one more vessel. Thus, 8-9 commercial trawlers will be exploring off U. S. east coast this year.

## 1966-67 Explorations

The U. S. Atlantic coast was explored in 1966 by Taiyo's "Taiyo Maru No. 32" (369 gross tons) and, in 1967, by Nihon Suisan's "Kaimon Maru" (2,500 gross tons) operated under charter to the Japan Overseas Trawlers Association. Taiyo's expedition was disappointing, but Nihon Suisan's trawler discovered good trawlable grounds; in particular, the abundance of butterfish and squid near 30° N. latitude off New York revealed feasibility of commercial operations.

Questions remain: (1) Are the fishing grounds broad enough to support simultaneous operations of about 10 Japanese trawlers? (2) To what extent can Atlantic-caught butterfish and squid be sold in Japan? (3) Can region be fished on sustained basis in competition with other foreign vessels? (4) Can trips be shortened to reduce costs? These and other problems involving marketing must be resolved before the region can be developed into a third major area for the Japanese trawl fleet. ("Minato Shimbun," May 9, 1968.)

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Japan (Contd.):

### CONTAINER SHIP LAUNCHED

Japan's first container ship, the 16,800-gross-ton "Hakone Maru," was launched May 17, 1968, at the Mitsubishi Heavy Industries Shipyard. Scheduled to be placed in service from Sept. 1 this year, she will call at San Francisco and Los Angeles on her first trip to North America.

The Hakone Maru will transport frozen tuna and other frozen fishery products to the U. S. She will carry back such imports as shrimp, beef, and lemons. The vessel has a carrying capacity of 15,800 tons, will carry 266 containers on deck, and has top speed of 26 knots.

She is one of 6 Japanese container vessels scheduled for the North Pacific route this year. ("Suisan Keizai Shimbun," May 21, 1968, and other sources.)



### Thailand

#### U. S. AIDS INLAND FISHERY DEVELOPMENT

The U.S. Agency for International Development (AID) plans about \$250,000 in technical fishery assistance, from mid-1968 through 1971, to the Thai Government in the "sensitive" Northeast Provinces. Thailand's contribution will be about \$1 million: \$211,000 in counterpart funds, and \$750,000 in budget authorizations.

The project's purpose is to increase freshwater fish production in the Northeast Provinces. This would increase the supply of high-protein food and the cash income of farmers. AID proposes to expand and improve the capabilities of the 8 Northeast provincial fishery stations; promote better training programs; expand research at the Bangkok Central Research Station, and survey the Northeast for areas suitable for small-scale fish culture.

#### Proposed Extension Service

Plans include establishment of an extension service. Eight 3-man mobile units will be set up to demonstrate the best use of irrigation for rice paddy fish culture, pond and

floating-basket pisciculture. Advice and training on fish culture will be provided. Fish fry will be supplied to village farmers at the lowest possible cost. (Present cost: \$10 per 100 fry.)

#### Proposed Research

In the research proposed by the plans, specialists will experiment at the Aquiculture Section at Bangkok; study methods of breeding species of fish suitable for production in Northeast Thailand; survey the prospects of making natural bodies of water suitable for fish culture.

The AID project aims at increasing fishery consumption in the Northeast in a relatively short time through effective extension work. Fish consumption now represents only 6 percent of the area's total protein requirement; in the Central Plains, fishery products already provide as much as 54 percent of all protein needs.

#### Mobile Units to Reach Many

The mobile units are expected to reach 250,000 to 500,000 villagers, in addition to those reached by the fishery stations. They are also expected to triple the fry distribution. In 1967, the stations distributed 2.25 million fry. During 1968-71, extension and research specialists at each station will receive more training in planning construction of fish ponds with village leaders, and in instructing farmers to breed fish in ponds and paddies. Planned for 1968-70 are 1,000 field demonstrations in pond and paddy fish culture.

Experimental fish culture in rice paddies has already been quite successful because farmers have paddies and need not wait for excavation of ponds. Experience shows that 55 to 1,250 pounds of fish per acre of rice paddy can be grown.

The Thai Department of Fisheries has already long-term plans for fresh-water fishery development. The target now is to increase annual production by 16 percent, from 86,000 metric tons in 1965 to 100,000 tons in 1971. Most of this increase will be generated in the Northeast.



## Malaysia

### BRUNEI PROMOTES FISHERIES RESEARCH

The Brunei (Malaysia) Fisheries Department's program to survey the deep-sea resources outside Brunei waters is now well underway.

A research trawler of the Malaysian Government was chartered by the Brunei State Government to conduct the survey in mid-April 1968. Another survey was scheduled to take place off Brunei by June 1968. During the 14-day survey in April, local fishermen were taken on board to learn about trawler fishing.

Dr. Birkenmeier, the Brunei State Fisheries Officer, said the survey will be repeated 3 to 4 times a year to determine the feasibility of trawler fishing off Brunei. Development of deep-sea fishing will depend greatly on the present survey's outcome.

All trawling was conducted outside the 3-mile territorial limits to avoid traditional fishing.

#### Pond Culture

Another program--construction of a fish-farm in the Sungai Jambu area near Brunei Town--is also progressing well. Initially, 23 ponds will be built to produce fish fry for distribution to pond owners in the State. Tilapia, lampam jawa, and gourami species will be used. Experiments to find out the suitability of other species for pond culture will also be undertaken at the Sungai fish farm.

Fisheries Department plans provide for facilities to demonstrate the construction of fish ponds, their maintenance, and the principles of stocking and other aspects of proper fisheries management.

Since Birkenmeier's arrival in Brunei a year ago, fisheries have become active. Birkenmeier, an Austrian, was recruited by the U. N., although Brunei pays his full salary. (U. S. Consulate, Kuching, April 19, 1968.)



## South Vietnam

### FISHERIES WERE NOT AFFECTED BY TET OFFENSIVE

South Vietnam's Fisheries Directorate surveyed the effects of the recent Viet Cong offensive on marine and freshwater fisheries.

In general, marine fisheries were affected only slightly. Landings remained normal. Only a few privately owned fishing vessels were destroyed.

A market survey on May 22, 1968, reveals fishery retail prices about 15 to 20 percent higher than pre-Tet prices. There has been a continuing decline in retail prices since the peak reached immediately after Tet.

#### Fish Hatcheries Damaged

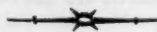
Five of the 9 freshwater fish hatcheries were damaged in varying degrees: almost 80 percent for hatcheries at Hue, Banmethuout, Bing Duong, My Tho, and Ving Long; 40-percent damage at Dalat and Thu Duc. Facilities and equipment were destroyed, and adult breeders lost. Resettling refugees on fish hatchery stations is hindering return to normal. Besides the Tet offensive, military offensives will further set back fish-hatchery facilities. This is particularly true at the Thu Duc fish hatchery near Saigon.

During January-April 1968, about 250,000 fingerlings were distributed, compared with 620,000 fingerlings in the 1967 period. Last year's distribution of 1.6 million fingerlings probably will not be reached under present conditions. The number in 1968 may not exceed one million.

It will not be possible to achieve the planned 10-percent increase in production of freshwater fish. Production may decline as much as 10 percent.

#### The Prospects

The marine fishing industry possibly will approach a 5-8 percent increase in total catch. At best, freshwater fish and pond-reared fish catches probably will reach no more than last year's 54,000 metric tons. The destruction of fish hatcheries will curtail fingerlings distributed. The number of new ponds constructed probably will remain low. Delta flooding, always an unknown factor, has a great influence on the tonnage of freshwater fish caught in any year. (U. S. Embassy, Saigon, May 31, 1968.)



## Taiwan

### TUNA SALES COMPANY FORMED

The China Marine Trading Co., a government-backed tuna sales firm formed by the Taiwanese tuna industry, was scheduled to start operations on June 18. The company was established with an investment of US\$250,000. It will handle sales of tuna caught by Taiwanese vessels and serve as central supplier of fishing gear and bait. It also plans to operate refrigerated carriers for the fishing fleet. Future plans include establishment and operation of overseas tuna bases in the Indian and Atlantic Oceans. ("Suisan Tsushin," June 1.)

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### TRANSFER OF TUNA VESSELS FROM AMERICAN SAMOA PLANNED

The Taiwanese tuna fishery operators based in American Samoa plan to transfer their large refrigerated vessels to other oceans because the South Pacific catch is declining. In 1967, their vessels accounted for over 35 percent of the total tuna catches delivered to the island.

### Taiwanese Fleet

The Samoa-based Taiwanese fleet is around 70 vessels, about 40 equipped with refrigeration. The Taiwanese hope to use their large 200-gross-ton vessels in the Indian and Atlantic oceans where there is good seasonal fishing for yellowfin and albacore. They expect no trouble finding suitable bases for their operation. In the Indian Ocean, the Japanese Overseas Fisheries Company operates a large tuna base at Port Louis, Mauritius. In other areas, the Japanese trading firms are actively seeking to contract Taiwanese vessels to fish for them.

### Agent for Taiwanese

The China Marine Trading Company also will represent Taiwanese vessels that land fish at Port Louis and at Tema, Ghana. ("Suisan Tsushin," May 24.)



## Indian Ocean Tuna Fishery Slackens, Prices Firm

Japanese long-liners have been fishing for yellowfin in the western Indian Ocean off Mombasa, Kenya, since late October 1967. Until the fishery began tapering off recently, good catches averaging 4-5 tons per vessel per day continued for months. Their shipment back to Japan began to weaken prices there. The long-liners moved southward gradually to albacore grounds off Durban, S. Africa.

### Off Durban

In the western Indian Ocean, off Durban, the albacore season normally starts in May. It continues good into late June. About 25 Japanese long-liners were fishing there in early May. So were close to 100 Taiwanese (Formosan) vessels. Japanese trading firms were said to be competing with each other to buy catches from the Taiwanese. One firm, reportedly with a refrigerated carrier vessel anchored at Tamotave, Malagasy Republic, was ready to receive the catches.

### Port Louis Prices

The Japanese Overseas Fisheries Co., which manages the tuna base at Port Louis, Mauritius Island, announced it would pay the prices shown below for Indian Ocean-caught tuna delivered to Port Louis in May 1968. Excepting the price for large albacore, reduced by US\$12 a short ton, the May prices were the same as April's. ("Katsuo-maguro Tsushin," May 2; "Suisan Tsushin," May 6.)

Species	May 1968
	Ex-Vessel Price US\$/Short Ton
<u>Albacore, round:</u>	
Large--over 24 pounds . . . . .	353
Small--under 24 pounds . . . . .	257
<u>Yellowfin, gilled &amp; gutted:</u>	
All sizes . . . . .	302
Fillets--over 26 pounds . . . . .	290
<u>Big-eyed, gilled &amp; gutted:</u>	
Over 66 pounds . . . . .	202
Fillets--over 26 pounds . . . . .	315
<u>Bluefin, gilled &amp; gutted:</u>	
Over 66 pounds . . . . .	202
Fillets--over 26 pounds . . . . .	264





## AFRICA

### South Africa

#### 'NORWEGIAN SEINING' MAKES DEBUT

Experiments in applying Norwegian purse-seining techniques to South African conditions are being carried out by 2 South African companies.

One company, the Oceana Group, decided to charter a Norwegian seiner, complete with skipper and crew, for a South African fishing season. This vessel is operating off the west coast.

The second company, Southern Sea, decided to convert a suitable vessel that became available in Cape Town. The company acquired the "Ali," a 12-year-old, 310-gross-ton, Dutch-built, side trawler with a steel hull in excellent condition.

The Ali's length, 139 ft. 6 in. overall, makes her the biggest purse seiner owned by a South African company. Had she been designed for purse seining, her beam of 23 ft. 7 in. would have been greater. Yet her fish hold, which held 120 tons of white fish in ice in her trawling days, should take 250 or more tons of pilchards with ease.

#### Norwegian Seiners

The big Norwegian seiners carry a bas-boat, or towing boat, used for two main functions in their fishery. It carries an auxiliary sonar installation. When a sizable shoal has been located by the mother vessel, the bas-boat is launched to obtain at close range information on its depth, direction, and approximate speed.

Meanwhile, the seiner stands off to avoid disturbing the fish. Only when she has received the report from the bas-boat, by walkie-talkie VHF radio, does she move in to trap the fish.

The second function of the towing boat is to pull the bows or stern of the seiner out of the net if the wind tends to push her hull towards it; for this work, she is given a powerful engine.

Most Icelandic seiners, on the other hand, use their towing boat for this second role only. It does the work of a transverse thrust propeller.

#### Southern Sea's Bas-Boat

Southern Sea has imported an 18-ft. glass-reinforced, plastic bas-boat from Norway. Whether it will be used for one or both of these roles will be decided after experiments on the fishing grounds. The plastic boat is powered by a 95-hp. diesel, equipped with hydraulic steering, and carries its own sonar fish finder. ("The South African Shipping News and Industry Review," Mar. 1968.)



### Ivory Coast

#### PLANS FISH IRRADIATION PROJECT

The Fisheries Department of Ivory Coast, West Africa, plans to initiate a fish-irradiation project. It awaits the arrival in a few months of a "Gamine III" irradiator modified for use with fish, fruits, grains, and vegetables.

#### French Aid

The project will be financed by France's Fonds d'Aide et de Cooperation (F.A.C.), subject to approval by the Fonds Européen de Développement (F.E.D.). The irradiator will be shared by other scientific and developmental institutions in Abidjan. It will focus primarily on the abundant sardinellas (*Sardinella aurita* and *Sardinella eba*) and the "Fritures" (*Otoporche aurita*). Preliminary work on this project was started in 1966 by two EURATOM experts. (Regional Fisheries Attaché, American Embassy, Abidjan, May 17, 1968.)





## Senegal

### FISHING INDUSTRY IMPORTANT BUT GROWTH SLOW

The fishing industry of Senegal is an important part of the economy--but prospects for significant growth are not good. The industry contributes about 3% of the country's gross domestic product, 10%-12% of its export cannings, and work for about 25,000 people.

The industry is largely "traditional." About 80%-85% of all fish landed are caught by small, canoe-type, fishing boats called "pirogues" that operate close to shore. Thirty-three percent of the pirogues are powered by outboard motors, which may be bought without paying Senegalese customs duties; the remaining 67% use sails.

The boats are manned by 2 to 6 fishermen and equipped with handlines and/or small nets. The bulk of their production is sold fresh in the local markets. There are no refrigerated trucks carrying fresh fish to the interior. There are no cold storage facilities outside Dakar and a few large interior cities.

Most of the statistics in this report are extremely rough estimates by government fishing experts.

#### Shrimp Fishing

Shrimp fishing in Senegal has been a growing industry and still has much room for development. Fishing experts believe that both sea and river shrimp production can easily be tripled without danger of "overfishing." Production in the 1966/1967 season was estimated at about 1,100 tons, 160 tons more than in 1965/1966. Virtually all present shrimp production is exported to France. The shrimp processing companies, however, have indicated interest in exporting to the U. S.

The shrimp trawlers operating out of Senegal fish mainly for the P. duorarum, found in two distinct zones: one over a large plateau extending north from Cayar, 100 Kms. north of Dakar, to Saint Louis on the Mauritanian border; the other is over a small plateau just south of Cape Roxo on Senegal's southern border with Portuguese Guinea.

#### Industrial Fishing

The few industrial fishing boats supplying the processing industry are mainly French

owned. In the 1966/67 season, there were 43 French boats. They serve primarily the tuna canning industry.

Senegal has 5 fishing vessels with freezing facilities belonging to the government-owned and operated Société Sénégalaise d'Armement et de Pêche (SOSAP). These boats were acquired from France under a loan agreement. Senegal wants to increase her share of industrial fishing. She ordered 10 tuna boats from the Soviet Union under the 1965 accord. The Soviets agreed then to loan Senegal \$6.7 million for the tuna industry.

Senegal also intends to buy four more boats from France for delivery by 1973. Senegal seeks to establish its own fishing fleet of 40 vessels capable of operating year-round out of Dakar.

#### Industrial Marketing

Almost all of her processed fish is exported to France. Senegal's tuna exports benefit from a higher-than-world-price under a yearly established quota (11,000 tons in 1966/1967 season). Tuna production has averaged only 8,000 tons in recent years, so Senegal has been able to sell virtually all of it to France at a profit. Otherwise, the tuna industry would have faced very low world prices and had to export at a loss.

Many local observers believe that the large (15,000-20,000 ton capacity) tuna-canning complex the government is considering building with Soviet help would be a financial disaster. They say present canning facilities are operating at less than 50% capacity. In all likelihood, there will be no further action on the tuna complex until 1973. By then, Senegal may have enough boats to guarantee an adequate supply for the proposed cannery.

#### Main Fish-Processing Establishments

Senegal's 3 tuna canneries, SAPAL, Conserverie du Sénégal, and SCAF, are in the Dakar-Rufisque vicinity. Total production capacity is around 20,000 tons--over twice the average landed catch during the past 3 years.

The supply of fish to the canneries is strictly controlled by a Paris-made agreement. Only the Comptoir Sénégalais des Industries de la Conserve Alimentaire (COSICA) is authorized to buy tuna directly from the fishermen. Then COSICA distributes to each

## Senegal (Contd.):

cannery the percentage of the French quota allotted to it. In the last two seasons, a 50% share was given to SAPAL, 30% to Conserveries du Sénégal, and 20% to SCAF. The quota eliminates any supply advantages a cannery might get if it owned its own fleet.

## Fish Flour\*

There is only one fish flour factory: Afric-Azote, on Dakar's outskirts. The company began in 1964 and has progressively increased production. It was 1,620 metric tons in 1966. A major expansion of plant facilities began in 1967 to raise the plant's present 2.5 ton/hr. capacity to 9 ton/hr.

The breakdown of Afric-Azote's raw materials is: 20% tunafish leftovers from canning plants and 80% sardinella. The fish flour from tuna leftovers contains 60%-63% protein, and from sardinella leftovers 65%-68% protein. However, the company has ordered a machine from Sweden that can raise protein content of tuna leftover flour to 65%-68% and of sardinella flour to 70%-72%.

Afric-Azote exports all its fish flour; 95% goes to France to be used primarily as poultry feed. The 1967 F.O.B. Dakar selling price was 40 CFA/kg. (\$0.16) for sardinella flour, and 38 CFA/kg. (\$0.15) for the tuna flour.

## Sardinella

Although 20%-40% of Senegal's total annual fish catch consists of sardinella, there is very little industrial processing of it for human consumption. In 1966, a small firm, the Société Africaine des Industries du Bâtiment (SAIB) undertook to can it. Virtually all its first year's production (130 metric tons) was exported to neighboring countries, which probably will remain its main customers. In Europe, the sardinella would have to compete against sardines, which have fewer bones and higher quality.

## Fish Freezing and Storage

The Société des Frigorifiques du Sénégal (SOFRIGAL) in Dakar handles almost all frozen fish business in Senegal. The firm is a joint venture: the Banque Nationale de Développement du Sénégal owns 35%, André Dhellemes et Cie de Roubaix SARL 32.5%, and Star-Kist Tuna Inc. the remaining 32.5%. The plant has a 100 ton/day fish-freezing capacity, a 2,000 ton storage capacity, and an ice-production capacity of 40 tons/day.

According to the official regulations governing the tuna fishing campaign, SOFRIGAL receives all frozen tuna landed in Dakar for reexport later. Since SOFRIGAL is not allowed to send more than 20% of its tuna exports to France in the form of skipjack, it may sell its excess frozen skipjack to the canneries.

\*Editor's Note: This is fish meal, not fish flour or fish protein concentrate (FPC).



## HOW DID SEAS, SUCH AS THE BLACK, RED, AND WHITE, GET THEIR NAMES?

Because the Black Sea is landlocked, it is deficient in oxygen, except near the surface. The high concentration of hydrogen sulphide causes a reducing environment (opposite of oxidation), resulting in a black color.

Oddly enough, the recurring bloom of small blue-green algae (Trichodesmium erythraeum) imparts the red color to the Red Sea.

The White Sea received its name from the ice that covers it more than 200 days a year.

The color of the Yellow Sea is caused by the yellow mud which is carried by rivers, especially when floods occur. ("Questions About The Oceans," U. S. Naval Oceanographic Office.)

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## RED TIDE USED IN ANIMAL FEED

Experiments show that red tide, *Gonyaulax polyedra*, a single celled plant pest, is a safe food for laboratory animals. According to a team of California and Pennsylvania researchers, rats thrive as well on red tide as on a diet rich in casein, a high quality milk protein. Powdered red tide has up to 26 percent protein including all the amino acids necessary for nutrition. It could also be used as a protein feed for cows but humans cannot digest it.

Red tide, a type of phytoplankton at the beginning of the aquatic food chain, grows abundantly in the ocean off California and Florida. Some scientists believe that temperature and the oxygen content of ocean water control the rate of its growth. So far they have been able to harvest only small quantities of the abundant tide using fine nets and seines to collect it. (Reprinted with permission from "Science News," weekly summary of current science, copyrighted 1966 by Science Service, Inc.)

Created in 1849, the Department of the Interior—America's Department of Natural Resources—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.



UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE  
BUREAU OF COMMERCIAL FISHERIES





# Fresh Seafoods By Air



Bureau of Commercial Fisheries personnel work with the coastal fishing industry, container manufacturers, airlines, retailers, and wholesalers in developing and expanding markets for fresh domestic fishery products. Particular emphasis is being placed on developing markets for fresh coastal seafoods in the Midwest and the East.

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